Saskatchewan
Agriculture

Plant Industry
Branch

Crop Protection
Section

Chemical Weed Control in Cereal, Oilseed, Pulse and Forage Crops 1984

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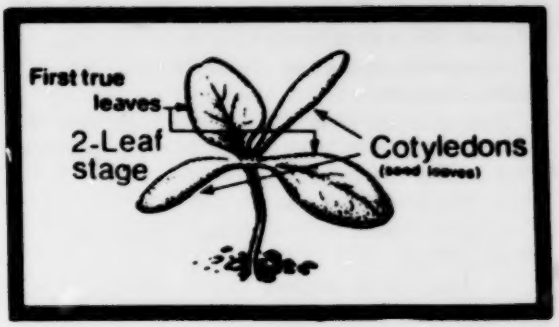
THIS PUBLICATION IS INTENDED AS A GUIDE TO WEED CONTROL. CONSULT PRODUCT LABELS FOR FINAL DETAILED INSTRUCTIONS BEFORE USING PRODUCT.

Foreword

Chemical weed control should be regarded as only one part of an overall weed control program n on the farm and should not be relied on as the only method of protecting crops from weeds. Thus, herbicide treatments should be used only where they are required to supplement good cultural and mechanical weed control practices. The best weed control method is a strong vigorous, competitive crop. For sources of additional information, see page 58.



How to use this book:

Begin by referring to the fold out chart in the centre of the book. Use the chart to determine the herbicides that can be used for your crop-weed combination. Then refer to the appropriate product reference pages for information on use of the products that can be used in your situation. Use these pages to help select the most appropriate herbicide.

All rate recommendations in this publication are in terms of the actual amount of the product to be used.

Factors that affect herbicide performance

The effectiveness of any given herbicide is affected by a large number of factors.

Thus, results often vary from year to year and from location to location. Knowledge of these factors and how they affect the performance of different products will help to avoid situations that may result in reduced control.

1. **Use the Right Herbicide** — The choice of herbicide depends on the type of weeds in the crop and the tolerance of the crop to various herbicides.
2. **Spray Early** — Weeds are easier to kill when young. Early weed eradication removes competition, saves moisture and increases yields. Crop stage must be considered.
3. **Apply the Correct Rate** — Using a properly calibrated sprayer.
4. **Growing/Soil Conditions** — The following factors can all influence herbicide performance.

   (a) Growing conditions — In general weeds are easiest to kill when they are small and growing rapidly. Translocated herbicides (eg. 2,4-D, Banvel) work best when weeds are actively growing. Contact type herbicides (eg. Torch, Pardner) usually do not lose as much activity when growing conditions are less favourable. Crops are generally more subject to damage when they are under stress.

   (b) Temperature/Humidity — High temperatures and low relative humidity result in rapid drying of droplets and greater herbicide loss due to evaporation. Crop injury may be increased with some products when temperature and humidity are both very high. Better weed control usually results when herbicides are applied during the cooler parts of the day.

   (c) Soil Moisture, Organic Matter, Texture — Soil incorporated herbicides are affected by these three factors. Weed control is best when soil moisture conditions are good. Excessive moisture will prevent adequate mixing of the products. Excessive drying of the soil during incorporation procedures will reduce their effectiveness. Granular formulations generally require more soil moisture than liquid formulations for similar results. Soils high in organic matter and/or clay will require higher rates of herbicide to obtain adequate control.

   (d) Rainfall — All products require a rain-free period after application to allow time for the weeds to absorb the chemical. Depending on the product, this period can range from 15 minutes to six hours or more.

   (e) Water Quality/Temperature — Extremely hard water or water containing large amounts of silt will inactivate some products resulting in nozzle plugging and reduced weed control.

   (f) Crop Competition — Many products depend on vigorous crop competition to assist in obtaining good weed control. Use of such products in unthrifty crops is not likely to be economical.
5. **Water Volume** — Good penetration of the crop canopy and good coverage of the weeds is essential for good weed control. Unless otherwise stated on the label, products should be applied in at least 100 L of water per ha.

Proper Use of Herbicides — It is an offence under the Pest Control Products Acts of Canada and Saskatchewan to use a herbicide in a manner other than as stated on the label. The user of these products has the responsibility to take every precaution to avoid harmful side effects from the use of herbicides. Great care should be taken to

avoid the contamination of water sources when filling sprayers.

Always Read the Label and Observe All Precautions

Reduce Spray Drift — Use AMINE or LOW VOLATILE (L.V) formulations of 2,4-D. No safe distances can be given.

— Use Lots of Water — Use of 90 - 110 L/ha will result in fewer small, "driftable" droplets.

— Use Low Pressures — 240 - 300 kPa is the recommended operating range for flat fan nozzles. Consult recommendations or product labels for specific requirements for various products.

— Use 80 degree nozzles. These nozzles can be run approximately 10 cm closer to the target weeds than can the traditional 65 degree nozzle. This lowering of boom height reduces exposure of the spray droplets to the wind and results in reduced droplet drift. 80 degree nozzles (designated as 80 degree LP nozzles) designed to operate at pressures as low as 100 kPa are being introduced and should further reduce drift hazards. These may not, however, be suitable for application of products such as barban which require fine droplets.

— Do Not Spray when winds are blowing toward sensitive plants or when wind velocity is high enough to cause significant drift.

Wetting Agents

Most herbicides contain sufficient wetting agent in the formulated product. Addition of extra wetting agent is not recommended unless the product label so recommends. Use only wetting agents that are registered for use and carry a Pest Control Products registration number on the label.

Herbicide Container Disposal

Problems and Potential Dangers of Indiscriminate Disposal of Waste Containers:

(i) Potential contamination of ground and/or surface waters if used containers are left lying near wells, streams, dugouts or in areas with high water tables.

(ii) Many residues left in containers are toxic to fish and other forms of wildlife.

(iii) Potential access by members of the public to dangerous chemicals is cause for concern. This is especially so with children playing with the used containers.

Procedure for Disposal

Saskatchewan Environment has initiated a voluntary program for the collection and crushing of metal pesticide containers discarded by farmers and the disposal of associated residues. Thoroughly rinsed containers may be delivered to collection sites selected by participating rural municipalities. If a collection site has not been designated within a rural municipality, the current best method for agricultural container disposal is to rinse, crush and bury the containers on the user's own farm.

Rinse:

Rinse containers well and add the rinse water to the sprayer tank to reduce the chemical residue left in the container to a minimum.

All rinsing procedures should take place away from wells and surface waters.

Crush:

All containers should be crushed as best as is practical to render them useless for any other task and to assist in the burial process.

Bury:

The burial site should be an uncropped area away from wells, ponds, streams, or livestock feeding areas. There should be little or no runoff and the water table in the area should be at least three (3) metres below the soil surface. A clay or loam soil is most suitable for the burial site. The area of disposal should be marked or recorded.

Bury containers at least thirty (30) cm below the surface. Compact the backfill to retard seepage.

Incorporation of Soil-Applied Herbicides

The recommended procedures for mixing or incorporating pre-emergent herbicides into the soil are given by the manufacturer of the herbicide. Long term studies have shown that such procedures will usually give the desired result. Exceptions occur though, due to the wide variety of soil and climatic conditions. Appropriate changes in the incorporation procedures can be of benefit under certain conditions. Some of the principles involved in the incorporation of herbicides are discussed below.

Herbicide: Different herbicides may require a different depth of incorporation for maximum effectiveness. The depth may vary depending on the prevalent weed to be controlled and the crop to be grown. For example, Treflan should be mixed relatively deeply for control of wild oats whereas a shallow depth is better for control of green foxtail. Be sure to read the label requirement. Coarse textured (sandy) soils and those soils with low organic matter may require different rates of herbicides than other soils.

Soil Condition: Loose, mellow soils are ideal for mixing the herbicide uniformly to the desired depth. Hard and lumpy soils, and those which are wet and sticky make it difficult to get uniform

and proper mixing. Different incorporation procedures are likely required for such soils.

Dry soil will, in many cases, limit herbicide activity. An incorporation procedure that dries out the soil just before seeding or even after seeding can result in poor weed control and poor emergence of the crop. Timing and the method of the incorporation is important where weather conditions will dry out the soil very quickly.

Referring again to hard lumpy soils; the type of herbicide used, that is liquid or granular, can determine the procedure to use for incorporation. Granules placed on hard lumpy soil before incorporation can fall between the lumps and go too deeply, whereas liquid is attached to the soil. Therefore, if granules are to be used, it may be necessary to prework the soil to get it into a condition where the granules will be mixed within the desired soil layer. Careful assessment of the condition is required. Such lumpy or sticky soils may require several operations to get them into a good condition for proper incorporation. Many operations though, can also further dry out the soil making it unsuitable for the crop to be planted.

The other extreme is the very loose soft soil where the recommended procedure for incorporation may leave the soil so fine that it will be subject to both wind and water erosion. Although this condition may be ideal for incorporation, the loss of eroded soil is costly. In this case soil incorporation should be avoided if alternate methods of weed control are available.

Equipment for Incorporation: All kinds of tillage equipment can be used to incorporate herbicides, but the choice depends on the herbicide to be used, its preferred location in the soil, the condition of the soil and the availability of such implements. The depth and speed of operation are also important. The incorporating action of various implements are discussed below.

Tandem disc harrows, discers and any kind of disc type implement will provide deeper incorporation, more soil breakdown, faster and more uniform mixing to the depth of tillage than most other implements. These should be used where deep incorporation is needed, where the soil is lumpy or sticky and where soil erosion is not considered to be a problem.

Cultivators of all kinds can be used but tend to give shallower incorporation. Deep tillage (10 cm or more) will give less soil disturbance than a shallower operation. For good mixing a higher travel speed is necessary; a speed high enough to throw soil upward and sideways will give more even incorporation. Higher speeds also help to break up lumps, but in loose soils will contribute to possibilities of erosion. Any kind of cultivator can be used (even hoe-drills will work), but shank spacing, speed, depth and kind of sweeps affect how well the incorporation is done.

Harrows are very useful for shallow incorporation but the soil needs to be loose if they are used; otherwise incorporation will be very shallow. Tine harrows behind cultivators contribute to better mixing due to the lively action of the tines. Drag harrows on stubble fields may not work very well for incorporation if they are constantly loaded with a lot of trash. Rotary or oscillating harrows are quite effective in trashy field conditions.

Rod weeders and wide blade machines are not capable of mixing herbicide in the soil and cannot be recommended for that purpose.

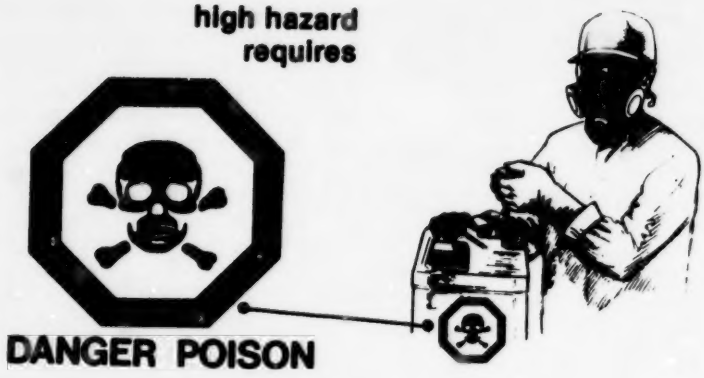
In stubble the most effective incorporation of liquid herbicide is obtained if the field is first worked until about two thirds of the surface is black. Bunches of straw and chaff left on the field will absorb the liquid and therefore good straw spreading at harvest time is important. Granules can be applied directly to stubble before tillage but as with the liquid herbicides the bunches of straw should be spread. The spray boom or granular attachment behind discers is also a very effective method for simultaneous application and incorporation when seeding stubble crops, as well as on summerfallow. Weed or volunteer crop growth on fields will also absorb liquid herbicide.

In summary it can be said that precaution and a careful assessment of the field, climatic conditions and herbicide requirement is needed before deciding on the incorporation procedure. If conditions are extreme, either more or less incorporation action will be needed. Do not overwork if not needed, but do enough to ensure the proper mixing and to get the herbicide in the right location.

Using Pesticides?

protect yourself!

high hazard
requires



DANGER POISON

goggles
respirator
avoid fumes
gloves and
skin protection

moderate hazard
requires

WARNING POISON

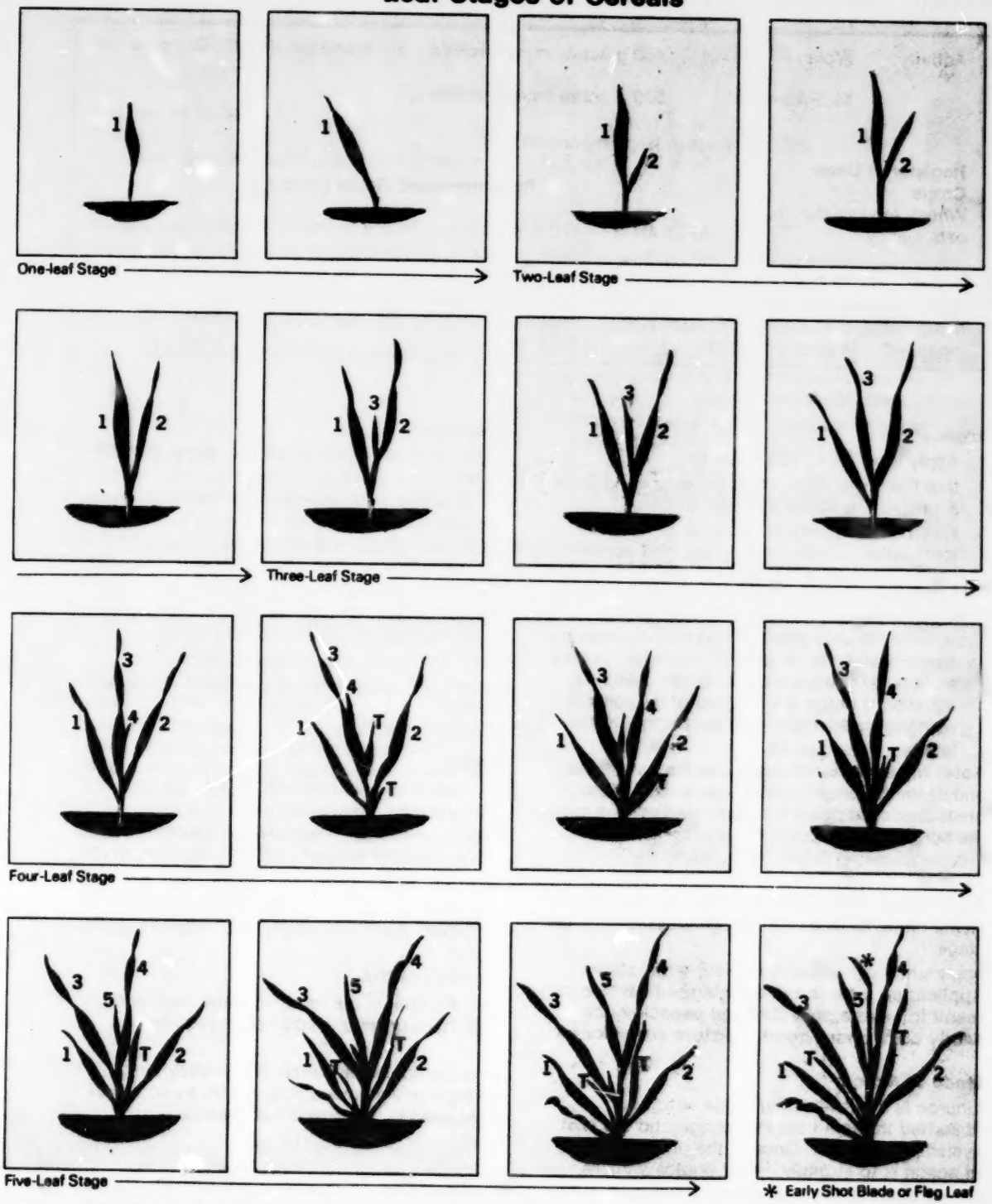
goggles
avoid fumes
gloves and
skin protection

low hazard
requires

CAUTION POISON

avoid fumes
gloves and
skin protection

Leaf Stages of Cereals



NOTE: The above drawings are a guide in following recommendations for herbicide application to wheat, oats, barley and rye. As an example, the two-leaf stage extends from the time the second leaf begins to emerge and continues until the third leaf begins to emerge. Tillers (T) are not counted as leaves.

Afolan F (linuron) + MCPA (1:2) — Tank-Mix

Activity:	Afolan F	450 g active ingredient/litre
	MCPA amine	500 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates (product)**
Wheat, (spring, durum), oats, barley	AFOLAN F — 470-620 mL/ha + MCPA amine — 1.1L/ha

Weeds controlled: Wild buckwheat, tartary buckwheat, green smartweed, cow cockle, hemp-nettle, corn spurry, chickweed, redroot pigweed, prostrate pigweed, Canada thistle top growth. All weeds controlled by 1.1 L/ha MCPA[1].

Application:

1. Apply in water in 100 L per ha.
2. Use the lower rates when growing conditions & rainfall are above average.
3. When using a wettable powder or flowable formulation certain precautions and sprayer adjustments must be made to ensure that it is applied correctly. Be sure that the sprayer is equipped with 50 mesh line strainers and screens. Stainless steel or hardened stainless steel nozzles are recommended. Also, pumps must be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.

Note: A jet agitator should never be put on the end of the by-pass line because a high back pressure develops on the pump and system when the booms are shut off.

Timing:

Apply when the weeds are in the 1-4 leaf stage. Hemp-nettle must be treated before the full 4-leaf stage.

Apply when the cereal is in the 2-4 leaf stage. **Application after the 4-leaf stage of cereals can result in severe crop damage especially on sandy soils under good moisture conditions.**

Mode of Action:

Linuron is a systemic herbicide which is absorbed through both the foliage and the root system of the plant. Once in the plant, its mode of action is to strongly inhibit photosynthesis. Outward appearance of affected plants is chlorosis (yellowing), stunting, and finally death which occurs in 10-14 days after treatment.

Precautions:

1. DO NOT use when crops are under drought stress.
2. DO NOT use on crops underseeded to forage crops.
3. DO NOT graze or feed green plants to livestock.
4. DO NOT re-treat field with a second application of linuron during the same crop year as injury to the crop may result.
5. DO NOT freeze liquid formulations.
6. DO NOT apply if rain is expected within one hour.

Mixing:

1. When mixing linuron with MCPA, the following is recommended:
   a) Pre-mix linuron wettable powder formulation with water in a clean pail.
   b) Half fill the spray tank with water.
   c) With hydraulic by-pass or mechanical agitator operating, slowly pour linuron into the tank.
   d) Add MCPA.
   e) Fill tank to the required water level and spray. Continuous agitation is required:

Note: Do not leave linuron in the spray tank overnight or vigorous agitation with a paddle will be required to resuspend the chemical.

2. Mix AFOLAN F at 470mL/ha with TARGET at 1.1-1.5 L/ha for control of broadleaf weeds in wheat, barley and oats.

[1]amine formulation. See page 46.

Asulox F (asulam)

Activity: 400 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Flax, seedling and established seed alfalfa	2.75 L/ha

Weeds controlled:
Wild Oats. Suppression of wild mustard, stinkweed, bluebur, wild buckwheat, smartweed, lady's-thumb, green foxtail (wild millet), barnyard grass when sprayed in the seedling stage.

Application:
Apply in 50-100 L of water/ha at a pressure of 275 kPa.

Timing:
For best results, apply when wild oats are in the 2-4 leaf stage and the flax is 2.5-15 cm tall. Do not spray seedling alfalfa before the first trifoliate leaf stage. Asulox will give suppression of several weeds other than wild oats when applied from the 1-3 leaf stage of these weeds. However, time the application to give best control of wild oats. Do not wait for possible later emergence of other weeds.

Mode of Action:
1. Asulox F checks growth of wild oats shortly after spraying but the full effect of the treatment may not be noticed for 2-4 weeks.
2. Temporary slight yellowing of the flax leaves may be seen a few days after spraying. Crop recovery from WILD OAT COMPETITION may be slow if the weeds have been allowed to smother the flax. Some reduction in crop height and delay in maturity may be noticed.

Precautions:
1. DO NOT spray when the crop is under stress due to drought, or in hot humid weather or when foliage is wet from rain or dew.
2. DO NOT spray if rain is expected within 8 hours.
3. DO NOT freeze.
4. DO NOT graze or feed treated crop.

Mixing:
1. Mix ASULOX F at 2.75 L/ha with BUCTRIL-M (450) at 930 mL/ha to control wild oats and broadleaf weeds in flax. Apply in 100 L of water per ha when wild oats are in the 2-4 leaf stage and the flax is 5-10 cm tall. Do not apply during hot humid weather or when flax is under stress.
2. Mix ASULOX F at 2.75 L/ha with EMBUTOX E at 1.5 L/ha to control wild oats and broadleaf weeds in seedling alfalfa (not underseeded) grown for seed production only. Apply when the wild oats are in the 2-4 leaf stage and the alfalfa is past the first trifoliate leaf stage. Do not apply to established alfalfa grown for seed production because of the risk of crop damage.
3. DO NOT mix with TCA, Dalapon or 2,4-D as crop damage may occur.

Avadex BW (triallate)*

Activity: 400 g active ingredient/litre
10% Granules

Registered Uses:

Crops	Recommended Rates (product) Spring Granular	Spring Liquid	Fall Granular	Fall Liquid
Wheat (spring, durum)	14 kg/ha	3.5 L/ha	14 kg/ha	3.5 L/ha
Barley	14-17 kg/ha	3.5-4.2 L/ha	14-17 kg/ha	3.5-4.2 L/ha
Canola, Flax and Mustard	17-22 kg/ha	4.2-5.6 L/ha	17-22 kg/ha	4.2-5.6 L/ha
Peas	17 kg/ha	4.2 L/ha	Not recommended	

Where a range is shown, use the lower rate on brown and shallow black soils and the higher rate on deep black soils with high organic matter content.

Underseeding:
Forage legumes such as alfalfa and clovers may be seeded with labelled crops treated with Avadex BW herbicide, provided the legumes are not harvested for green crop, silage or hay in the year of seeding.

Weeds Controlled: Wild oats.

Formulations:

Liquid formulation — Use on soils that are free of trash. Incorporate as soon as possible on the day of spraying, preferably immediately. On hot windy days, large losses can result from delayed incorporation. Apply in 100 L of water per ha at 200 kPa.

Granular formulation — Use on all soils including those carrying heavy trash cover. Granular Avadex BW is especially well suited to fall application.

Application:

Spring — Use **before** seeding canola, mustard or flax. Use **before or after** seeding barley. For wheat apply **at or after** seeding only. Incorporate immediately according to directions.

Fall — Apply after October 1 and before freeze-up and incorporate. Till the following spring at depths no greater than 6 cm to avoid dilution of the chemical which could result in reduced wild oat control and possible injury to sensitive crops such as wheat and barley.

The margin of crop safety is not as great when wheat is seeded into soil which has been fall treated with Avadex BW as when the chemical is applied after seeding in the spring since it is extremely difficult to accurately place the seed below the fall treated layer of soil. This is especially true on heavy clay soils. When seeding wheat into fall treated soils, very careful attention must be paid to placing the seed at a uniform depth of 6-7.5 cm. Placement of the seed into treated soil will result in stand reductions and delayed maturity.

Incorporation

A. Spring

Applied after seeding — Avadex BW applied after seeding wheat or barley should be incorporated with a double harrowing at right angles. This is the preferred method for use with wheat where drills are used. The double harrowing may dry out the soil sufficiently to inactivate the herbicide. A light rain within 2-3 weeks of application is then required for re-activation.

Applied at seeding — Avadex BW can be applied at seeding by mounting a spray boom or granular applicator behind a discer and applying the herbicide during the seeding operation. With proper adjustments, this provides excellent wild oat control, crop safety and minimum disturbance and drying of the soil. This is the preferred treatment for barley and wheat in areas where discer seeders are used. Fields should be harrowed after seeding to ensure adequate mixing of the chemical in the soil.

Applied before seeding — The most satisfactory incorporation is with a disc-type implement set to cut 6 cm deep followed by harrowing at right angles. Cultivators do not give as satisfactory incorporation and may result in wild oat misses. If a cultivator is used, a vibrashank type is

***Warning** — "Safety data and registration of this product are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using".

preferred. It should be set to cut 6 cm deep followed by a harrowing at right angles. A double harrowing at right angles will also give satisfactory incorporation provided the soil is loose and free of trash cover allowing the harrows to penetrate.

B. Fall

When applied in the fall Avadex BW requires incorporation to hold the chemical in position and reduce overwintering losses to a minimum. It is possible, however, to delay a part of the incorporation procedures until spring. This is especially true when using the granular formulation.

In **stubble,** the use of the granular formulation is recommended since trash cover must be destroyed prior to using the liquid formulation. Hard or lumpy ground should be disced once prior to application to ensure proper mixing of the granules. The most satisfactory incorporation is with a disc-type implement set to cut 6 cm deep followed by a harrowing at right angles. Cultivators do not give as satisfactory incorporation and may result in wild oat misses. If a cultivator is used, a vibrashank type is preferred. It should be set to cut 6 cm deep and followed by a harrowing at right angles. In both cases (disc or cultivator incorporation) the second incorporation can be delayed until spring. If a deeper working of the field is desired, this deeper working should be carried out in the fall before Avadex BW is applied.

On **summerfallow,** incorporation should be accomplished with a disc followed by a harrowing at right angles, a vibrashank cultivator followed by a harrowing at right angles or a double harrowing. The second operation can be delayed until spring.

If summerfallow must be ridged in the fall to prevent soil erosion the granular formulation should not be used in the fall. If soil must be ridged after incorporating liquid Avadex BW the depth of the ridging should be kept to a minimum as deep ridging may decrease the wild oat control or cause crop injury. On fields where erosion is a threat, spring application or the use of a post emergent product is preferred over fall treatment with Avadex BW.

Seeding Depth:

Canola, mustard and flax have good tolerance to Avadex BW and can be planted into the treated layer at normal depth for these crops. Since barley and wheat are more sensitive, they should be planted 6-7.5 cm deep to reduce the chance of crop injury. It is especially important that wheat seed be below the treated layer of soil.

General:

Some wild oat seedlings may emerge before being killed. As growth ceases, the leaves become brittle and bluish green in color.

Seedlings that germinate in treated soil are killed quite rapidly. Seedlings that germinate below the treated layer are killed more slowly and the amount of growth prior to death increases as the depth of the seed increases. A seedling emerging from a depth of 15 cm may reach a height of more than 5 cm before it dies. On the other hand, wild oat plants that reach the two-leaf stage before the Avadex BW is activitated by sufficient moisture may still be controlled.

Under normal conditions, Avadex BW will not leave a harmful residue in the soil to affect following crops. Under dry conditions, however, some Avadex BW may carry over. Therefore, oats should not be sown the year following application of Avadex BW.

Precautions:

1. The liquid formulation should be protected from freezing. If it does freeze it can be reconstituted by warming to 20 degrees Celsius and agitating.
2. Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation operation could result in soil erosion.
3. The margin of safety is not as great when **wheat** is seeded into soil which has been fall treated with Avadex BW as when the chemical is applied after seeding in the spring since it is extremely difficult to accurately place the seed below the layer of soil. This is especially true on heavy clay soils. Seed placement at the bottom of the cut of the disc can be improved by lengthening the tubes through which the seed falls, thus reducing the free fall distance of the seed. When seeding wheat into fall treated soils, very careful attention must be paid to placing the seed at a uniform depth of 6-7.5 cm. Placement of the seed into treated soil will result in stand reductions and delayed maturity.
4. There are no grazing restrictions.
5. Rainfall or moisture is necessary for activation. Rainfall before incorporation may increase the loss of Avadex to the atmosphere.

Mixing:

1. Mix AVADEX BW (liquid formulation) at 3.5 L/ha in wheat or 3.5-4.2 L/ha in barley with TREFLAN (liquid formulation) at 1.1 L/ha on light soils and 1.5 L/ha on medium to heavy soils for control of wild oats and green foxtail (wild millet). Use only on fields free of trash. Apply in 100 L of water/ha after seeding and incorporate with a double harrowing at right angles. Seed should be placed 5-7.5 cm deep.

2. Avadex BW liquid may be applied in combination with dry urea fertilizer or dry

mixed fertilizers (e.g. ammonium nitrate) in either spring or fall. A minimum of 150 kg/ha of dry fertilizer must be used to ensure uniform distribution of the herbicide. Sufficient Avadex BW must be blended with the fertilizer (using commercial fertilizer blending equipment only) to give the correct rate of chemical for the fertilizer rate being used to a maximum of 4.2 L/ha. Spread the fertilizer as soon as possible after blending with a **properly calibrated** and adjusted spreader. Spin spreaders should be calibrated to apply ½ the desired rate per hectare and application overlapped by doubling back to cover ½ of the previous swath. Dribble spreaders must be calibrated with the fertilizer/ chemical mixture since the flow pattern will be slower than for straight dry urea. Incorporate immediately after spreading using normal Avadex BW procedures. Only pre-plant incorporated applications are recommended in the spring. **For best results with spring preplant applications, delay the second incorporation for at least 24 hours.**

Avenge 200-C (difenzoquat)

Activity: 200 g active ingredient/litre

Registered Uses:

Crops	**Recommended Rates (product)**
Barley, wheat (Glenlea, Neepawa, Chester, Macoun, Selkirk, Canuck, Benito, Columbus, Leader, Fielder), Canary Seed, Winter wheat (Norstar, Sundance), Triticale (Welsh, Carman), Fall Rye (Cougar, Puma, Frontier, Kcdiak)	3.5-4.25 L/ha

Underseeding:
Forage Crops such as alfalfa, sweet clover, red clover, bird's-foot trefoil, creeping red fescue, meadow fescue, bromegrass, timothy, crested wheatgrass, orchardgrass, Russian wild ryegrass, reed canarygrass, Kentucky bluegrass may be seeded with wheat or barley and treated with Avenge alone, provided the forages are not to be grazed or harvested for feed during the year of seeding.

Weeds controlled: wild oats.

Application:
1. Apply in 100 L of water per ha.
2. Use the higher rate when the wild oat density is more than 120/square meter or when the wild oats are in the 3 leaf stage.
3. Pressure at the nozzle tips should be 275 kPa and the boom should be rotated to direct the spray pattern 45 degrees forward.

Timing:
1. Apply when the majority of the wild oats are in the 3-5 leaf stage but before the crop is past the 6 leaf stage.
2. Later applications may give better control but yield response will not be as great because of the competition which occurs prior to control.

Mode of Action:
1. The activity of Avenge is primarily through contact action. Therefore, good spray coverage is essential.
2. Under cool weather conditions, certain barley varieties such as Herta and Bonanza may show some initial burning on lower leaves.

Precautions:
1. DO NOT hold spray solutions in galvanized tanks for more than 24 hours.
2. Wash sprayer out thoroughly with water after spraying.
3. DO NOT apply when plants are wet with dew or rain.
4. DO NOT apply if rain is forecast within six hours.
5. DO NOT apply if frost is forecast the same evening.
6. If stored below 5 degrees Celsius, salting out will occur. This can be reversed by warming and agitating.
7. DO NOT graze or feed forage crops during the year of establishment, or other crops 8 weeks after treatment.

Mixing:

1. Mix AVENGE 200-C at 3.5-4.25 L/ha with BUCTRIL-M (450) or BROMOX 450 M or BROMINAL-M (450) at 1.25 L/ha or with BUCTRIL -M (562) at 1.0 L/ha or BROMINAL-M (400) at 1.4 L/ha or SABRE at 780 mL/ha to control wild oats and broadleaf weeds in barley and the listed varieties of wheat. **Note:** Only Buctril-M is registered for use on winter wheat.
2. Mix AVENGE 200-C at 3.5-4.25 L/ha with TORCH or PARDNER (225) at 1.25 L/ha or with TORCH DS at 625 mL/ha or PARDNER (281) at 1.0 L/ha to control wild oats and broadleaf weeds in barley and the listed varieties of wheat. **Note:** Only Pardner is registered for use on winter wheat.
3. Mix AVENGE 200-C at 3.5-4.25 L/ha with MCPA ester at 1.1 L/ha or with 2, 4-D LV ester (600 g active ingredient/litre) at 700-930 mL/ha to control broadleaf weeds in barley and the listed varieties of wheat.
4. Apply AVENGE 200-C and broadleaf herbicide tank mixes in 100 L of water/ha when the wild oats are in the 3-5 leaf stage. Add the broadleaf herbicide at the start of filling then fill tank to ¾ and add AVENGE 200-C. Top off spray tank with remaining water. **Note:** When using SABRE or TORCH DS in a tank-mix continuous agitiation is important.
5. DO NOT mix AVENGE 200-C with 2,4-D Amine, MCPA amine, BANVEL, or mixtures containing these products.
6. DO NOT mix AVENGE 200-C with ANY broadleaf herbicide for use on underseeded forages.

Banvel LH (dicamba)

Activity: 400 g active ingredient/litre

Registered Uses:

Recommended Rates (product)

Product	Wheat (spring, durum, winter), Oats	Barley	Established Grasses
Banvel LH	275-350 mL/ha	275 mL/ha	700 mL/ha
Banvel LH + 2,4-D[1] (tank-mix)	275-350 mL/ha + 840 mL/ha (not recommended on Oats)	275 mL/ha + 840 mL/ha	
Banvel LH + MCPA[1] (tank-mix)	275-350 mL/ha + 840 mL/ha	275 mL/ha + 840 mL/ha	

Weeds controlled by Banvel + 2,4-D or MCPA tank mixes: (1.2 L/ha) Bluebur, tartary buckwheat, wild buckwheat, burdock, field bindweed top growth, cleavers, cow cockle, cocklebur, flixweed, lamb's-quarters, ball mustard, dog mustard, hare's-ear mustard, Indian mustard, tumble mustard, wild mustard, wormseed mustard, prostrate pigweed, red root pigweed, Russian pigweed, wild radish, common ragweed, false ragweed, giant ragweed, Russian thistle, shepherd's-purse, annual smartweed species, lady's-thumb, annual sow-thistle, perennial sow-thistle top growth, stinkweed, Canada thistle top growth, corn spurry, knotweed, tame buckwheat.

[1]These rates are for the amine formulations of 2,4-D & MCPA (500 g active ingredient/litre). For rates of other 2,4-D & MCPA (formulations see conversion factors on page 47).

Application:

Use at least 100 l. of water/ha to reduce the risk of crop injury.

Timing:

1. Spray at the 3-4 leaf stage of wheat and oats and the 3 leaf stage of barley. Treatment at the 3 leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility. In winter wheat apply in spring when crop is 15-25 cm tall, before the shot blade stage.
2. Application at higher rates or after the 4 leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering the yield may also be reduced. Very severe yield losses due to sterility will result from treatment during the flag leaf stage to the early heading stage.
3. For established grass stands apply up to the shot blade stage. Banvel can be mixed with 2,4-D amine for a broader spectrum of weed control. DO NOT use on seed fields.

Mode of Action:

Banvel is a translocated herbicide which affects the roots of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals or grasses underseeded to legumes.
2. DO NOT freeze.
3. DO NOT apply if rainfall is expected within 4 hours.
4. DO NOT slaughter meat animals fed with treated forage or grazed on treated areas within 30 days after the herbicide application.
5. DO NOT graze or harvest cereal crops for livestock feed prior to crop maturity.

Mixing:

1. Banvel at 275-350 mL/ha in wheat and oats or 275 mL/ha in barley can be tank-mixed with MCPA amine at 840 mL/ha, MCPA SODIUM SALT at .93-1.4 L/ha, or MCPA POTASSIUM SALT at .7-1.1 L/ha. BANVEL at 275-350 mL/ha in wheat or 275 mL/ha in barley can be tank-mixed with 2,4-D AMINE at 840 mL/ha.
2. Mix Banvel LH at 275 mL/ha with Sencor 500 at 400-560 mL/ha or Lexone DF at 280-370 g/ha on barley and Sencor 500 at 400 mL/ha, Lexone DF at 280 g/ha on wheat when the crop is in the 2-3 leaf stage. DO NOT apply to Klondike barley. Allow a 4-5 day interval between the use of these mixtures and application of a wild oat herbicide.

Basagran (bentazon)

Activity: 480 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Peas, Fababeans, Flax	1.75-2.25 L/ha

Weeds controlled: Wild mustard, stinkweed, lady's-thumb, smartweed, redroot pigweed, lamb's-quarters, Russian thistle, cocklebur, purslane, corn spurry, common groundsel, common chickweed when sprayed in the seedling stage. For top growth control of Canada thistle a repeat application 7-10 days after the first application is required.

Application:

1. Apply post-emergence in 220 L of water/ha at 275-425 kPa.
2. Use the higher rate for pigweed, lamb's-quarters, and Russian thistle or when lady's-thumb, smartweed and cocklebur are advanced.
3. The addition of Citowett Plus at .25% of total spray mixture will improve the control of advanced weeds. DO NOT use Citowett Plus on fababeans or flax.
4. The addition of Assist Oil Concentrate at 0.5% of total spray mixture will improve the control of advanced weeds. DO NOT use Assist Oil Concentrate on peas.
5. Best results are obtained when Basagran is applied under high temperature conditions when weeds are growing actively.

Note: Slight leaf-yellowing, bronzing, speckling or burning may occur if the crop has been stressed by drought, flooding, hail or previous herbicide damage, or widely fluctuating temperatures.

Timing:

1. Apply after peas have 3 pairs of leaves.
2. Apply after fababeans are 10 cm tall.
3. Apply after flax is 5 cm tall.

Mode of Action:

Basagran is a contact herbicide so for best results weed leaf surfaces must be thoroughly covered by the spray.

Precautions:

1. DO NOT apply when rain is expected within 8 hours.
2. If Basagran is frozen, warm to room temperature and shake well.
3. There are no grazing or feed restrictions.

Mixing:

DO NOT tank-mix Basagran with other pesticides, fertilizers or spray adjuvants.

Basfapon, Dowpon (dalapon)

Activity: 74% water soluble powder

Registered Uses:

Crops	Recommended Rates (product)
Flax, canola, peas	1.1-1.5 kg/ha
Seedling alfalfa and sweetclover	2.2-3.4 kg of Dowpon M/ha

Weeds controlled: Green foxtail, other annual grasses.

Application:

1. Apply in 100-165 L of water per ha when the foxtail is in the 1-3 leaf stage. Flax should be 10-15 cm tall. Canola should have 2-4 leaves. Pea vines should be 10-15 cm long. Seedling legumes should be 5-8 cm tall.
2. Use the higher rate on heavy infestations or when foxtail is at a more advanced stage.

Timing:

Best results are obtained when applied to young weeds which are activly growing (1-3 leaf stage).

Mode of Action:

Dalapon is a growth inhibitor. Control symptoms may not become obvious for 2-3 weeks after treatment.

Precautions:

1. Dalapon is mildly corrosive to equipment. Therefore, flush spraying equipment with plenty of water immediately after use.
2. DO NOT feed treated crop residues to livestock as residues may appear in meat and milk.
3. DO NOT apply when rain is expected within 4 hours.

Mixing:

1. Mix BASFAPON or DOWPON at 1.1-1.5 kg/ha with MCPA AMINE at .7-1.1 L/ha or MCPA SODIUM SALT at 1.2-1.9 L/ha in 100-165 L of water/ha for control of green foxtail and broadleaf weeds in flax. Apply when the green foxtail is in the 1-3 leaf stage. Completely dissolve Basfapon or Dowpon in water before adding MCPA.
2. Mix BASFAPON or DOWPON at 1.1-1.5 L/ha with PREMERGE 360 at 2.7-4.2 L/ha to control mustard, stinkweed, volunteer canola and green foxtail in peas. Apply in 100-200 L of water/ha when the peas are 10-20 cm long. Follow all precautions listed for PREMERGE 360.
3. Mix BASFAPON or DOWPON at 1.1-1.5 L/ha with TROPOTOX at 4.2 L/ha to control broadleaf weeds and green foxtail in peas. Apply in 150-200 L of water/ha when the peas have 3-6 expanded leaves.

Benazolin (benazolin)

Activity: 330 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Canola	2.1 L/ha

Weeds controlled: Wild mustard, Canada thistle top growth.

Application:

Apply in 55-100 L of water per ha.

Timing:

Apply when the canola has 3-5 true leaves & the wild mustard has 2-4 leaves.

Mode of Action:

Similar to 2.4-D and MCPA.

Precautions:

1. DO NOT apply with a sprayer that is contaminated with 2,4-D or MCPA. See section on sprayer clean-out procedures
2. Protect from freezing.
3. DO NOT apply if rain is expected within 4 hours.

Mixing:

DO NOT tank-mix BENAZOLIN with other pesticides, fertilizers or spray adjuvants.

Biagal (cyanazine and MCPA-K 1:2)

Activity: 375 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum)	2.25 L/ha
Barley	
Oats	
Flax	

Weeds controlled: Tartary buckwheat, wild buckwheat, smartweed, lady's-thumb, hemp-nettle, stinkweed, corn spurry, chickweed, lamb's-quarters, ball mustard, wild mustard, wormseed mustard, trumble mustard, topgrowth control of Canada thistle, other weeds controlled by 1.1 L/ha MCPA[1].

Application:
Apply in 100 L of water/ha at 275-310 kPa. Thorough coverage is necessary for good results. Maintain continuous agitation during mixing and application. Use 50 mesh screens or larger. DO NOT use felt filters. DO NOT use flood jet type nozzles.

Timing:
Apply when the cereal is in the 2-5 leaf stage and when the flax is 5-10 cm tall. Spray after weeds have one true leaf and before they have five leaves. Do not spray flax during hot, humid weather.

Mode of Action:
Cyanazine inhibits photosynthesis causing yellowing of leaves and eventual death of susceptible plants. Crops under stress from lack of moisture or extreme temperatures may show temporary yellowing. MCPA susceptible weeds will show typical MCPA symptoms.

Precautions:

1. DO NOT overlap.
2. Avoid prolonged contact with skin.
3. DO NOT graze or feed the immature crop from the treated area to livestock.
4. DO NOT treat cereals underseeded to forage or green manure legumes.
5. DO NOT spray if rainfall is expected within 4 hours.

Mixing:
DO NOT mix with other herbicides or wetting agents.

[1]amine formulation — See page 46.

Brominal — M/Bromox 450 M (bromoxynil + MCPA mixtures)

Product:	Component:	Activity:
Brominal-M	bromoxynil and MCPA (1:1)	400 g active ingredient/litre 450 g active ingredient/litre
Bromox 450 M	bromoxynil and MCPA (1:1)	450 g active ingredient/litre

Registered Uses:

Crops	Recommended Rate (product)
Wheat (spring, durum), barley, oats, flax, canary seed	1.4 L/ha (400)/1.25 L/ha (450)

Weeds controlled: cow cockle, green smartweed, lady's-thumb, Russian thistle, tartary buckwheat, wild buckwheat, lamb's-quarters, stinkweed, wild mustard, redroot pigweed, night-flowering catchfly, kochia, common groundsel, ball mustard, flixweed, tumble mustard, wormseed mustard, scentless chamomile (seedling only), bluebur, shepherd's-purse, common ragweed, top growth control of Canada thistle and perennial-sow thistle, volunteer sunflowers, volunteer canola.

Application:

Apply in 100 L of water per ha.

Timing:

Brominal-M and Bromox 450 M can be safely applied to cereals from the 2-leaf stage until the appearance of the flag-leaf, to flax when the crop is 5-10 cm tall and to canary seed in the 3-5 leaf stage. Best results are obtained from applications made at the early leaf stages.

Mode of Action:

Bromoxynil is a contact herbicide. Therefore, thorough coverage of the weeds is required for good control.

Precautions:

1. In flax, some leaf burn and retarded growth may delay maturity 2-3 days. Severe injury may result if flax is treated when the plants are under stress.
2. DO NOT apply mixtures containing bromoxynil during hot, humid weather as this may result in temporary leaf scorch.
3. There must be a 30 minute interval between application and rainfall.
4. DO NOT freeze.
5. There are no grazing restrictions.

Mixing:

1. Mix BROMINAL-M at 1.4 L/ha (400) or 1.25 L/ha (450), or BROMOX 450 M at 1.25 L/ha with AVENGE 200-C at 3.5-4.25 L/ha to control broadleaf weeds and wild oats in barley and Glenlea, Neepawa, Chester, Columbus, Leader, Macoun, Selkirk, Canuck or Benito wheat. Apply in 100 L of water per ha when wild oats are in the 3-5 leaf stage. Add the broadleaf herbicides at the start of filling then fill tank to ¾ full and add AVENGE. Top off spray tank with remaining water.
2. Mix BROMINAL-M at 1.4 L/ha (400) or 1.25 L/ha (450), or BROMOX 450 M at 1.25 L/ha with MCPA at 560 mL/ha to control hemp-nettle in wheat, barley and oats.
3. Mix BROMINAL-M at 1.4 L/ha (400) or 1.25 L/ha (450), or BROMOX 450 M at 1,25 L/ha with POAST at recommended rates to control broadleaf and grassy weeds in **flax.** Apply in a minimum 100 L of water per ha when the grass weeds are in the 2-5 leaf stage and flax is 5-10 cm tall. Follow the mixing instructions as recommended for Poast (page 31).

Buctril-M (bromoxynil and MCPA 1:1)

Activity: 450 g active ingredient/litre, 562g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum, winter), barley, oats, flax, fall rye, canary seed, seedling grasses (bromegrass, crested wheatgrass, intermediate wheatgrass, slender wheatgrass, tall wheatgrass, Russian wild ryegrass, timothy, orchardgrass, creeping red fescue, meadow fescue and reed canarygrass when sown for seed production in the year of establishment only).	1.25 L/ha (450)/1.0 L/ha (562)

Weeds controlled: Cow cockle, green smartweed, lady's-thumb, Russian thistle, tartary buckwheat, wild buckwheat, lamb's-quarters, stinkweed, wild mustard, redroot pigweed, night-flowering catchfly, kochia, common groundsel, ball mustard, flixweed, tumble mustard, wormseed mustard, scentless chamomile (seedling only), bluebur, shepherd's-purse, common ragweed, top growth control of Canada thistle and perennial sow-thistle, volunteer sunflowers, volunteer canola, cocklebur.

Application:

Apply in 100 L of water per ha.

Timing:

Buctril-M can be safely applied in the spring to cereals from the 2-leaf stage until the appearance of the flag-leaf and to flax when the crop is 5-10 cm tall. Apply to seedling grasses in the 2-4 leaf stage and to canary seed in the 3-5 leaf stage. Best results are obtained from applications made at the early leaf stages.

Mode of Action:

Bromoxynil is a contact herbicide. Therefore, thorough coverage of the weeds is required for good control.

Precautions:

1. In flax, some leaf burn and retarded growth may delay maturity 2-3 days. Severe injury may result if flax is treated when the plants are under stress.
2. DO NOT apply mixtures containing bromoxynil during hot, humid weather as this may result in temporary leaf scorch.
3. There must be a 30 minute interval between application and rainfall.
4. DO NOT freeze.
5. There are no grazing restrictions.

Mixing:

1. Mix BUCTRIL-M at 930 mL/ha (450) or 750 mL/ha (562) with ASULOX F at 2.75 L/ha to control wild oats and broadleaf weeds in flax. Apply in 100 L of water/ha when the wild oats are in the 2-4 leaf stage and the flax is 5-10 cm tall. DO NOT apply during hot humid weather or when flax is under stress.
2. Mix BUCTRIL-M at 1.25 L/ha (450) or 1.0 L/ha (562) with AVENGE 200-C at 3.5-4.25 L/ha to control broadleaf weeds and wild oats in barley and those varieties of wheat and fall rye registered for AVENGE 200-C. Apply in 100 L of water per ha when the wild oats are in the 3-5 leaf stage. Add the broadleaf herbicide at start of filling then fill tank to ¾ full and add Avenge 200-C. Top off spray with remaining water.
3. Mix BUCTRIL-M at 1.25 L/ha (450) or 1.0 L/ha (562) with MCPA at 560 mL/ha to control hemp-nettle in wheat, barley, oats and flax.
4. Mix BUCTRIL-M at 1.25 L/ha (450) or 1.0 L/ha (562) with TCA at 1.3 kg/ha or TCA Solution at 2.0 L/ha to control green foxtail and broadleaf weeds in **barley** only. Apply in 100 L of water/ha when green foxtail has 1-3 leaves and barley 2-4 leaves.
5. Mix BUCTRIL-M at 1.25 L/ha (450) or 1.0 L/ha (562) with POAST at recommended rates to control broadleaf and grassy weeds in **flax.** Apply in a minimum 100 L of water per ha when the grass weeds are in the 2-5 leaf stage and flax is 5-10 cm tall. Follow the mixing instructions as recommended for Poast (page 31).

Carbyne/Carbyne 2EC (barban)*

Product:	**Activity:**	
Carbyne	120 g active ingredient/litre	
Carbyne 2 EC	240 g active ingredient/litre	
Registered Uses:	**Recommended Rates (product)**	
Crops	**Carbyne**	**Carbyne 2EC**
Flax,	2.5-2.9 L/ha	1.2-1.5 L/ha
Wheat (spring, durum), barley, mustard, canola, lentils, peas, sunflowers, fababeans	2.5-3.5 L/ha	1.2-1.75 L/ha
Alfalfa, sweet clover, red clover, alsike clover, bromegrass, Russian wild ryegrass	2.5-3.5 L/ha	1.2-1.75 L/ha
Seedling grasses for seed only (Timothy, creeping red fescue, crested wheatgrass)	2.5-3.5 L/ha	1.2-1.75 L/ha
Weed controlled: Wild oats.		

Application:

1. Apply in 45 L of water per ha at a pressure of 310 kPa.
2. Direct spray pattern 45 degrees forward and adjust boom height to give uniform coverage.
3. Spray drift can be further reduced under windy conditions by using flood type nozzles at a nozzle spacing of 100 cm. Operate at 275 kPa and direct the spray pattern 45 degrees forward. Adjust boom height to obtain uniform coverage.
4. Use the higher rate when the wild oat density is 50 plants per square meter or more, or when wild oats are not actively growing, i.e. under dry, cool conditions or when wild oats have been injured by frost or wind.

Timing:

1. Apply at the two-leaf stage of the wild oats, that is, from the first appearance of the second leaf until the first appearance of the third leaf.
2. Best results are obtained when the wild oats reach the two-leaf stage in less than 9 days after emergence. When growth is slow, spray before the 14th day after emergence.
3. DO NOT treat wheat, barley or lentils after they have reached the 4-leaf stage or 14 days after emergence.
4. DO NOT treat flax before the 2 (true) leaf stage or after the 12-leaf stage or 14 days after emergence.
5. DO NOT apply to peas after the 5-leaf stage.
6. DO NOT apply to forage legumes and grasses after they have reached the 4-leaf stage.

Mode of Action:

Barban kills or stunts wild oat plants. The effect is gradual and may not be visible for 2-3 weeks after spraying. The degree of control is largely dependent upon the informity of emergence of the wild oats.

Precautions:

1. DO NOT apply when the crop is wet with dew or rain.
2. These herbicides may be stored at freezing temperatures, but must be returned to their original state by warming to room temperature (20-22°C) and agitating thoroughly on several successive days before use.
3. DO NOT graze or feed treated crop for 5 weeks after treatment.
4. Crop damage may occur if sprayed within 24 hours of frost.
5. Wild oat and crop growth will be retarded when cold, dry, or low fertility conditions exist.

Mixing:

DO NOT mix CARBYNE or CARBYNE 2EC with other pesticides, fertilizers or spray adjuvants.

***Warning** — "Safety data and registration of these products are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using".

Dyvel (dicamba + MCPA K)

Activity: 420 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat, (spring, durum), barley, oats	1.25 L/ha

Weeds controlled: Hemp-nettle*, cow cockle, wild buckwheat, green smartweed, lady's-thumb, corn spurry, Russian thistle, lamb's-quarters, pigweed (prostrate, redroot, Russian), mustards (except dog mustard), ragweeds, stinkweed, cocklebur, top growth control of Canada thistle and perennial sow-thistle.

* Suppression only

Application:

Use at least 100 L of water/ha to reduce the risk of crop injury.

Timing:

1. Spray at the 2-4 leaf stage of wheat and oats and the 3 leaf stage of barley. Treatment at the 3 leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility.
2. Application at higher rates or after the 4 leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering, the yield may also be reduced. Very severe yield losses due to sterility will result from treatment during the flag leaf to the early heading stage.

Mode of Action:

Dyvel is a translocated herbicide which affects the roots of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals underseeded to legumes.
2. DO NOT freeze.
3. DO NOT apply if rainfall is expected within 4 hours.
4. DO NOT graze or harvest for livestock feed prior to crop maturity.

Mixing:

DO NOT tank-mix DYVEL with other pesticides, fertilizers or spray adjuvants.

Embutox E/2,4D Butyric 400 (2,4-DB)

Note: These products are recommended for use on cereals underseeded to legumes (except sweet clover).

Activity:

Embutox E	400 g active ingredient/litre
2,4D Butyric 400	400 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum), barley, oats	2.75-3.5 L/ha
seedling alfalfa, bird's-foot trefoil, alsike clover, red clover, white clover, pastures containing forage legumes	2.75-4.25 L/ha

Weeds controlled at 2.75 L/ha: ragweed, redroot pigweed, mustards (wild, wormseed, ball), lamb's-quarters, stinkweed, shepherd's-purse.

Suppression or Top growth Control at 3.5-4.25 L/ha: oakleaf goosefoot, plantain, yellow rocket, chicory, wild buckwheat, wild radish, lady's-thumb, smartweed, bull thistle, perennial sow-thistle, Canada thistle, curled dock, narrow-leaved hawk's-beard, field bindweed, horsetail, dandelion.

Application and Timing:

1. Apply in 150-200 L of water per ha when the legumes are in the 1-4 trifoliate leaf stage and when the cereal is between the 4-leaf and flag-leaf stages.
2. In pastures containing forage legumes apply after cutting or grazing when the regrowth is not above 7 cm tall.

Mode of Action:

Mode of action is similar to 2,4-D and MCPA.

Precautions:

1. DO NOT use on sweet clover.
2. Oats are susceptible to damage if treated with Embutox E or 2,4D Butyric 400 before 5-leaf stage.
3. Embutox E may be stored at freezing temperatures but must be returned to its original state by warming to room temperature (20-22°C) & agitating thoroughly on several successive days before use. DO NOT freeze 2,4D Butyric 400.
4. Rainfall before foliage has dried from spraying may decrease activity.
5. There are no grazing restrictions.

Mixing:

1. Mix EMBUTOX E at 1.5 L/ha with ASULOX F at 2.75 L/ha to control broadleaf weeds and wild oats in seedling alfalfa (not underseeded) grown for seed production only. Apply when the alfalfa is past the first trifoliate leaf stage and the wild oats are in the 2-4 leaf stage.
2. DO NOT tank-mix 2,4D Butyric 400 with other herbicides or spray adjuvants.

Eptam-8E (EPTC)

Activity: 798 g active ingredient/litre
10% granular

Registered Uses:

Crop	Recommended Rates (product)
Sunflowers	33.6 kg/ha (granular)/ 4.25 L/ha (liquid)
Seedling alfalfa	

Weeds controlled: barnyard grass, corn spurry, green and yellow foxtail, wild oats, chickweed, lamb's-quarters, prostrate pigweed, purslane, redroot pigweed, tumble pigweed.

Application:

Apply to a dry, trash free soil surface in 100 L of water per ha and incorporate immediately.

Timing:

Spring — Apply prior to seeding.

Incorporation:

Incorporate immediately. Tandem discs should be set to cut 10-15 cm and operate at a speed of 7-10 km/h and followed by a spike toothed harrow or some other leveling device which extends beyond the ends of the discs. On medium and heavy textured soils two workings at right angles are required. On light sandy soils, one operation may be adequate. One-way discs should be set to cut 12.5-15 cm deep and operated at 7-10 km/h and followed by a spike-toothed harrow or some other leveling device which extends beyond the ends of the discs. Cross discing is required for adequate incorporation. Field cultivators can be used in light soils which are in good tilth. Use 3 or 4 rows of sweeps spaced at 17.5 cm intervals or less followed by a spike-tooth harrow pulled behind the cultivator. Use 17.5 cm or wider sweeps. Set the cultivator to cut 12.5-15 cm deep and operate at a minimum of 10 km/h. Run the equipment over the field twice. The second run should be at an angle to the first.

Mode of Action:

Eptam controls susceptible weeds by interfering with germination and normal seedling development.

Precautions:

1. Although EPTAM-8E is registered for use in flax, it is not recommended for use in Saskatchewan because of the risk of crop phytotoxicity.
2. DO NOT apply to moist or trashy soil surfaces.
3. EPTAM-8E is volatile and will be lost rapidly especially from a wet soil surface. Incorporate within minutes of application, preferably in the same operation.
4. DO NOT freeze. If frozen, warm to room temperature and shake well on several successive days.
5. EPTAM-8E is not a persistent herbicide. Late germinating weeds may not be controlled. Therefore, seed as soon as possible after treatment. Shallow cultivation may be necessary to control late germinating weeds.
6. **Note:** Speeds in excess of 8 km/h will result in excessive pulverization and trash destruction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm.
7. Eptam is very soluble in water & excessive moisture may leach Eptam from the surface.

Mixing:

EPTAM 8E may be tank-mixed with liquid and granular fertilizers except for nitrate based fertilizers. DO NOT mix with other pesticides or spray adjuvants.

Estaprop (dichlorprop and 2,4-D 1:1)

Activity: 600 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum, winter), barley	1.75 L/ha

Weeds controlled: annual sow-thistle, mustards (ball, dog, hare's-ear, Indian, tumble, wild, wormseed), bluebur, burdock, cocklebur, flixweed, kochia, lady's-thumb, lamb's-quarters, oak-leaved goosefoot, ragweeds, redroot pigweed, Russian pigweed, Russian thistle, shepherd's-purse, smartweeds, stinkweed, stork's bill, tartary buckwheat, wild buckwheat.

Top-growth control of Canada thistle, curled dock, perennial sow-thistle. Under poor growing conditions, lady's-thumb, smartweeds and buckwheats will be suppressed but not completely controlled.

Application:

Apply in 100 L of water per ha.

Timing:

Apply from 4-leaf stage to just before the flag-leaf stage of the crop. Best results will be obtained when applied to rapidly growing weeds in the 2-4 leaf stage. In winter wheat apply in spring after full tillering but before the shot blade stage.

Mode of Action:

Similar to 2,4-D and MCPA.

Precautions:

1. Slight crop injury may result at 1 75 L/ha but where weed infestation is heavy this should be overcome by reduced weed competition.
2. DO NOT use on grain underseeded to legumes.
3. There is no information available on grazing restrictions or the effect of rainfall after application.

Mixing:

DO NOT mix ESTAPROP with other pesticides, fertilizers or spray adjuvants.

Glean (chlorsulfuron)*

Activity: 75% dry flowable

Registered Uses:

Crops	Recommended Rates (product)
Wheat, (spring, durum) barley	15-30 g/ha

Weeds controlled at 15 g/ha: Lamb's-quarters, hemp-nettle, wild mustard, volunteer rapeseed, redroot pigweed, stinkweed, lady's-thumb, green smartweed.

Weeds controlled at 30 g/ha: Above weeds plus cow cockle, chickweed, kochia, cleavers, wild buckwheat, Russian thistle and Canada thistle top growth.

Application:

Add the proper amount of Glean to the required volume of water in the spray tank with the agitator running. Continuous agitation is required to keep the product in suspension. After Glean has been well mixed and is in suspension then add a spray adjuvant (e.g. Agsurf, Agral 90, or Citowett Plus) at 100 mL for each 100 L of spray mixture. Apply only with ground equipment in a minimum of 60 L of water/ha with flat fan nozzles. When using flood jet or raindrop nozzles apply 225 L/ha total spray volume. Use 50-mesh screens or larger.

Timing:

Apply when wheat or barley is in the 2-leaf to flag leaf stage. Best results are obtained when applied to small and activity growing weeds. Treat wild buckwheat at the 1-3 leaf stage and Canada thistle when 15 cm in height but before flowering.

Mode of Action:

Glean is a systemic herbicide and rapidly stops growth of susceptible plants. However, typical symptoms (discoloration and wilting) of control may not be noticeable for 7-10 days after treatment.

Precautions:

1. Apply only on land having a soil pH of 7.5 or lower.
2. At pH 7.0 or lower only wheat or barley may be seeded the season following Glean application. At pH 7.0 to 7.5 only wheat may be seeded, barley may be seeded the second season (2 years) following Glean application.
3. FOR CROP ROTATION FLEXIBILITY DO NOT USE GLEAN ON ALL LAND IN WHEAT OR BARLEY PRODUCTION. Refer to product label for recropping guidelines.
4. DO NOT allow spray mixture to remain in the tank for more than 24 hours before spraying, or effectiveness may be reduced. Use vigorous agitation to thoroughly disperse spray mixtures that have been allowed to stand in the tank.
5. DO NOT apply or allow drift onto desirable plants or non-target land areas, cropland, water, irrigation or drainage ditches.
6. DO NOT apply to wheat or barley undersown with other crops as injury to other crops will occur.
7. DO NOT exceed a total of 30 g product/ha within a 12 month period.
8. Immediately after spraying, thoroughly clean all traces of Glean from application equipment to avoid possible injury to other crops.
   a. Drain tank then flush tank, boom and hoses with clean water for a minumum of 10 minutes.
   b. Fill tank with clean water, then add ½ litre chlorine bleach (containing 5¼% sodium hypochlorite) per 100 litres of water. Flush through boom and hoses then allow to sit for 15 minutes with agitation; then drain. **Note:** DO NOT use chlorine bleach with ammonia.
   c. Repeat step b.
   d. Nozzles and screens should be removed and cleaned separately. To remove traces of chlorine bleach rinse tank thoroughly with clean water and flush through hoses and boom.
9. SEE LABEL FOR DETAILED PRECAUTIONS AND FOLLOW ALL LABEL DIRECTIONS.

Mixing:

DO NOT mix with other herbicides or any other pesticides.

* This product has a temporary registration. Additional technical information is required in relation to its use. Be advised that the current label may be revised. Directions for use and cautionary statements should be carefully followed.

Hoe-Grass (diclofop methyl)

Activity: 190 g active ingredient/litre, 284 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum, winter), flax, canola, mustard (brown and yellow), barley (except Klages, Betzes, Norbert), peas, lentils, fababeans spring and fall rye, triticale, sunflowers (except Corona) seedling bromegrass*, creeping red fescue*, crested wheatgrass*, intermediate wheatgrass*, Russian wild ryegrass*, alfalfa*, red clover*, sweet clover*	3.75 L/ha (190)/2.5 L/ha (284)

Weeds controlled: Wild oats, green and yellow foxtail, Persian darnel, barnyard grass, volunteer corn.

* Use in year of establishment only. DO NOT use Forage for Feed.

Application:

1. Apply in 100 L of water/ha at 275 kPa.
2. Direct the spray pattern 45 degrees forward for best results. Adjust boom height to ensure uniform coverage.
3. Apply at least 4 days before applying broadleaf herbicides. Only Torch or Pardner (bromoxynil) can be tank-mixed with Hoe-Grass.

Timing:

Optimum weed control is obtained when weeds are in the 1-3 leaf stage. For volunteer corn apply when corn is 15-25 cm in height.

Apply to barley in the 1-4 leaf stage and prior to tillering (usually not later than 21 days after emergence of the barley). Application beyond the 4 leaf stage or after tillering may result in damage.

Mode of Action:

Symptoms of Hoe-Grass appear in 2-3 days as a yellowing of the treated plants. Chlorosis progresses and death of the plants occurs in about two weeks.

Precautions:

1. DO NOT graze treated crop.
2. DO NOT apply when rain is expected within one hour.
3. DO NOT freeze.
4. Thoroughly clean sprayer of all other herbicide (i.e. 2,4-D, MCPA, dicamba, etc.) residues before applying Hoe-Grass.
5. Allow at least 4 days before using broadleaf herbicides. DO NOT apply broadleaf herbicides before using Hoe-Grass.
6. During periods of stress (i.e. very hot (28°C) and/or dry conditions or very low humidity) plants are not actively growing. Application of Hoe-Grass during these periods may result in significantly reduced weed control. Yellow blotches may appear on the crop leaves under these conditions.
7. Apply before tillering of grassy weeds.

Mixing:

1. Mix HOE-GRASS at 3.75 L/ha (190) or 2.5 L/ha (284) with TORCH or PARDNER (225) at 1.25 L/ha or with TORCH DS at 625 mL/ha or PARDNER (281) at 1.0 L/ha to control grassy and broadleaved weeds in wheat and barley (except Betzes, Norbert, Klages) and TORCH at 1.25 L/ha or TORCH DS at 625 mL/ha in flax. Apply in 100 L of water/ha at a pressure of 275 kPa. Apply when the weeds are in the 1-3 leaf stage and before the grassy weeds have tillered. Do not apply when flax is less than 5 cm tall. Do not apply to barley after the 4-leaf stage or more than 21 days after emergence. During periods of stress (i.e. very hot (28 C) and/or dry conditions or low humidity) plants are not actively growing. Better control of grassy weeds will be achieved if HOE-GRASS is applied alone rather than as a tank-mix with TORCH or PARDNER under these conditions. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control. **Note:** When using TORCH DS in a tank-mix continuous agitation is important.
2. DO NOT mix with any other herbicides (except TORCH or PARDNER), insecticides, fungicides, fertilizers or any additives as this will reduce the effectiveness of HOE-GRASS and a reduction in grassy weed control will occur.

Hoe-Grass II (diclofop methyl & bromoxynil mixture)

Activity: 310 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum), flax	3.5 L/ha
Barley (except Klages, Betzes, Norbert)*	

Weeds controlled: wild oats, green and yellow foxtail, Persian darnel, barnyard grass, volunteer corn, wild and tartary buckwheat, lady's-thumb, green smartweed, kochia, common groundsel, knawel, night-flowering catchfly, cow cockle, wild mustard, scentless chamomile, stinkweed, lamb's-quarters, redroot pigweed, Russian thistle.

* Caution should be used when applying Hoe-Grass II to these varieties. There is a risk of crop injury under hot, dry conditions.

Application:

1. Apply in 100 L of water/ha at 275 kPa and a ground speed of 6-8 km/hr.
2. Direct the spray pattern 45 degrees forward and adjust boom height to ensure optimum coverage. Use of 80 degree stainless steel flat fan nozzles are recommended.
3. DO NOT apply an additional herbicide within a minimum of 4 days after Hoe-Grass II application.

Timing:

Optimum weed control is obtained when grassy weeds are in the 1-4 leaf stage and when the broadleaf weeds are in the seedling to 4 leaf stage. For Persian darnel apply at the 1-3 leaf stage, for volunteer corn apply when corn is 15-25 cm in height, and for Russian-thistle apply when height is 5 cm. or less. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.

Apply to barley in the 1-4 leaf stage and prior to tillering. Application beyond the 4 leaf stage or after tillering may result in crop damage.

Mode of Action:

Grassy weed control symptoms of Hoe-Grass II appear in 2-3 days as a yellowing of the treated plants. Chlorosis progresses and death of the plant occurs in about 2 weeks. Broadleaf weed control is by contact action. Thorough coverage of the weeds is required for optimum results.

Precautions:

1. DO NOT graze treated crop.
2. DO NOT apply when rain is expected within one hour.
3. DO NOT freeze.
4. Thoroughly clean sprayer of all other herbicide residues before applying Hoe-Grass II.
5. Allow an interval of 4 days before using other herbicides.
6. Application of Hoe-Grass II during hot, humid weather may result in temporary leaf scorch. Reduced grassy weed control may result if application is made when plants are not actively growing due to very hot and/or dry conditions.

Mixing:

DO NOT mix with herbicides, insecticides, fungicides, fertilizers or any other chemicals or additives as this will reduce effectiveness of Hoe-Grass II.

Kerb 50-W (propyzamide)

Activity: 50% wettable powder

Registered Uses: **Crops**	**Recommended Rates (product)**
Established pastures	0.9 to 1.1 kg/ha
Established alfalfa, birds-foot trefoil	1.75 to 3.25 kg/ha

Weeds controlled:
0.9 to 1.1 kg/ha — Foxtail barley
1.75 kg/ha — Annual grasses, volunteer cereals, wild oats
2.25-3.25 kg/ha — Above weeds plus quackgrass, orchardgrass, timothy, chickweed.

Application and Timing:

1. Premix Kerb 50-W in water and apply uniformly with flat fan nozzles at a minimum 220 L of water/ha. Only 50 mesh or larger metal filters and nozzle screens should be used. Maintain good agitation during mixing and spraying.
2. Apply to established pastures, seeded at least 2 years prior to application, between October 1 and freeze-up. Use 0.9 kg/ha on brown, dark brown, or gray-wooded soils, and 1.1 kg/ha on thin black or black soils.
3. Apply to established alfalfa or birds-foot trefoil, pure stands only, from late September to early November. Best results are obtained when soil temperature is low but above freezing and soil moisture is high.

Mode of Action:

Kerb 50-W acts through root absorption. Moisture carries Kerb 50-W into the root zone killing germinating seedlings when they begin to grow in the spring.

Precautions:

1. DO NOT harvest or graze within 90 days after application of 3.25 kg/ha, or 60 days after rates less than 3.25 kg/ha.
2. DO NOT plant other crops in Kerb treated soil for 9 months following application.
3. DO NOT apply on high organic soils; peat, muck, or thick black soils.
4. DO NOT use in seed grass stands.
5. DO NOT use on stands of timothy and fescue grass species.
6. Less tolerant grasses (Kentucky bluegrass) may experience a 10-20% stand reduction.
7. DO NOT overlap spray swaths.

Mixing:

DO NOT tank-mix KERB 50-W with other herbicides, fertilizers or spray adjuvants.

Kilmor (dicamba + mecoprop + MCPA)

Activity: 500 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum, winter), oats	0.85-1.1 L/ha
Barley	850 mL/ha

Weeds controlled: Kilmor (850 mL/ha): Wild buckwheat, lady's-thumb, smartweeds, Russian thistle, sow-thistle, corn spurry, knotweed, tame buckwheat, ragweeds, cocklebur, stinkweed, mustards (except dog mustard), pigweeds (prostrate, redroot), lamb's-quarters.

Kilmor (1.1 L/ha): Cow cockle, cleavers*, tartary buckwheat, flixweed, shepherd's-purse, Canada thistle top growth.

* Suppression only

Application:

Use at least 100 L of water/ha to reduce the risk of crop injury.

Timing:

1. Spray at the 3-4 leaf stage of wheat and oats and the 3 leaf stage of barley. Treatment at the 3 leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility. Apply to winter wheat in spring before crop is 30 cm high.
2. Application at higher rates or after the 4 leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering, the yield may also be reduced. Very severe yield losses due to sterility will result from treatment during the flag leaf to early heading stage.

Mode of Action:

Kilmor is a translocated herbicide which affects the roots of the plant. It is slower than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals underseeded to legumes.
2. DO NOT freeze.
3. DO NOT apply if rainfall is expected within 4 hours.
4. DO NOT graze or harvest for feed prior to crop maturity.

Mixing:

DO NOT tank-mix KILMOR with other pesticides, fertilizers or spray adjuvants.

Lexone DF (metribuzin)

Activity: 75% dry flowable

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum)	275 g/ha
Barley (except Klondike)	275-350 g/ha
Lentils	280 g/ha
Fababeans	Lexone & Treflan (tank-mix only) (See Below)

Weeds controlled: Hemp-nettle, chickweed, corn spurry, lamb's-quarters, stinkweed, volunteer canola, wild mustard, tartary buckwheat, ball mustard, smartweed, lady's-thumb. Wild buckwheat is not controlled. Use the higher rate for best residual control of chickweed and hemp-nettle or when weed infestation is heavy.

Application:

Pre-mix Lexone with water in a clean pail before adding to spray tank. Apply in 100 L of water/ha. Sprayer should be equipped with tips no finer than 6502, 8002 or LF2, nozzle screens no finer than 50 mesh and 50 mesh or larger line strainers. A pump of sufficient capacity to provide adequate volume through the by-pass and/or jet agitation system is essential. Crop must be seeded at least 5 cm deep.

Timing:

Apply when the cereal crop is in the 2-5 leaf stage. Early application of Lexone to lentils (prior to 15 cm vine length) in 170 L of water/ha reduces risk of crop injury. Do not use on lentils seeded less than 5 cm deep or in soils with less than 3% organic matter. Allow 3 days after cool, wet weather before application of Lexone to lentils.

Mode of Action:

Lexone is a systemic herbicide and kills susceptible plants by inhibiting photosynthesis. Control may not be noticeable for 7-10 days after treatment.

Precautions:

1. Lexone may be applied when the crop is wet with dew but weed control may be reduced if there is rainfall within 6 hours after application.
2. Initial temporary (7-10 days) lightening in crop color and occasionally a slight reduction in crop height may occur especially if frost or abnormally high temperatures occur with 1-2 days of application. If frost occurs prior to application, allow 4-5 days for crop to recover before applying Lexone.
3. DO NOT use on crops underseeded to forages.
4. DO NOT graze or feed treated cereal crops to livestock within 30 days of application. DO NOT harvest for grain within 60 days of application. For lentils do not harvest or feed within 70 days of application.
5. Continuous agitation is required during spraying. Do not let spray mixture stand without agitation or settling may occur.
6. Allow a 4-5 day interval between application of Lexone and wild oat herbicides.

Mixing:

1. Mix LEXONE DF at 275-350 g/ha on barley and at 275 g/ha on wheat with MCPA amine at .84-1.1 L/ha when the crop is in the 3-5 leaf stage.
2. Mix LEXONE DF at 275 g/ha with BANVEL LH at 275 mL/ha on barley and wheat when the crop is in the 2-3 leaf stage. Do not use on Klondike barley.
3. For broadleaf and grassy weed control in fababeans mix LEXONE DF at 400-550 g/ha with TREFLAN at 2.0-2.6 L/ha for fall application. For spring application mix LEXONE DF at 350-550 g/ha with TREFLAN at 1.5-2.0 L/ha in 100 L water and incorporate immediately following recommendations for TREFLAN incorporation.

Lorox L (linuron) + MCPA (1:2) — Tank-Mix

Activity:	Lorox L	480 g active ingredient/litre
	MCPA amine	500 g active ingredient/litre
	MCPAK (potassium salt)	400 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum), oats, barley	LOROX L — 425-550 mL/ha + MCPA amine — 1.1 L/ha
Wheat (spring, durum), barley	LOROX L — 425-550 mL/ha + MCPA K — 1.0-1.4 L/ha

Weeds controlled: Wild buckwheat, tartary buckwheat, green smartweed, cow cockle, hemp-nettle, corn spurry, chickweed, redroot pigweed, prostrate pigweed, Canada thistle top growth. All weeds controlled by 1.1 L/ha MCPA[1].

Application:

1. Apply in water in 100 L per ha.
2. Use the lower rates when growing conditions & rainfall are above average.
3. When using a wettable powder or flowable formulation certain precautions and sprayer adjustments must be made to ensure that it is applied correctly. Be sure that the sprayer is equipped with 50 mesh line strainers and screens. Stainless steel or hardened stainless steel nozzles are recommended. Also, pumps must be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.

Note: A jet agitator should never be put on the end of the by-pass line because a high back pressure develops on the pump and system when the booms are shut off.

Timing:

Apply when the weeds are in the 1-4 leaf stage. Hemp-nettle must be treated before the full 4-leaf stage.

Apply when the cereal is in the 2-4 leaf stage. **Applicaton after the 4-leaf stage of cereals can result in severe crop damage especially on sandy soils under good moisture conditions.**

Mode of Action:

Linuron is a systemic herbicide which is absorbed through both the foliage and the root system of the plant. Once in the plant, its mode of action is to strongly inhibit photosynthesis.

Outward appearance of affected plants is chlorosis (yellowing), stunting, and finally death which occurs in 10-14 days after treatment.

Precautions:

1. DO NOT use when crops are under drought stress.
2. DO NOT use on crops underseeded to forage crops.
3. DO NOT graze or feed green plants to livestock.
4. DO NOT re-treat field with a second application of linuron during the same crop year as injury to the crop may result.
5. DO NOT freeze liquid formulations.
6. DO NOT apply if rain is expected within one hour.

Mixing:

1. When mixing linuron with MCPA, the following is recommended:
   a. Pre-mix linuron wettable powder formulation with water in a clean pail.
   b. Half fill the spray tank with water.
   c. With hydraulic by-pass or mechanical agitator operating, slowly pour linuron into the tank.
   d. Add MCPA.
   e. Fill tank to the required water level and spray. Continuous agitation is required.

Note: Do not leave linuron in the spray tank overnight or vigorous agitation with a paddle will be required to resuspend the chemical.

2. Mix LOROX L at 425 mL/ha with TARGET at 1.0-1.5 L/ha to control broadleaf weeds in wheat, barley and oats.

[1]amine formulation. See page 46.

Herbicide Recommendations

For

Cereal, Oilseed and Pulse Crops

How To Use This Chart:

1. **Locate the weed(s) you wish to control.**
2. **Read down the weed(s) column(s) to see which chemicals will give control.**
3. **Check the crops section to see which of the herbicides can be used in the crop concerned.**
4. **Consult the appropriate page for information on use of specific chemicals.**

Crops and Weeds

	Products	See Page	Wheat (spring, durum)	Winter Wheat	Barley	Oats	Rye	Flax	Canola	Mustard	Sunflowers	Peas	Lentils	Canary Seed	Fababeans
			Crops												
—	AFOLAN + MCPA[1] (1:2)	6	●		●	●									
—	**ASULOX F**	7						●							
◈	AVADEX BW SPRING FALL	8	·/·		·/·			·/·	·/·	·/·	·				
◈	**AVENGE 200-C**	10	●	●	●		●							●	
—	BANVEL LH	11	●	●	●	●									
▽	**BANVEL LH + 2,4-D OR MCPA Mix**	11	●	●	●	●									
▽	BASAGRAN	12						●				●			●
—	**BASFAPON/DOWPON**	13						●	●			●			
—	BENAZOLIN	13							●						
—	**BLAGA[1]**	14	●		●	●		●							
◈	BROMINAL M/BROMOX 450 M	15	●		●	●		●						●	
◈	**BUCTRIL M**	16	●	●	●	●	●	●						●	
▽	CARBYNE/WYPOUT	17/45	●[T]		●			●	●	●	●	●	●		●
▽	**DYVEL**	18	●		●	●									
▽	EMBUTOX E 2,4D BUTYRIC 400	19	●		●	●									
▽	**EPTAM-8E**	20									●				
◈	ESTAPROP	21	●	●	●										
▽	**GLEAN**	22	●		●										
—	HOE-GRASS	23	●	●	●		●	●	●	●	●	●	●		●
◈	**HOE-GRASS II**	24	●		●			●							
▽	KILMOR	26	●	●	●	●									
—	**LEXONE**	27	●		●								●		●[n]
—	LOROX + MCPA[1]	28	●		●	●									
▽	**MATAVEN**	29	●	●							●			●	
—	MCPA[1]	46	●	●	●	●	●	●				●[d]			
—	**MECOTURF/COMPITOX**	29	●		●	●									
◈	PARDNER	30	●	●	●	●	●							●	
▽	**POAST**	31						●	●						
⊙	PREMERGE 360/SINOX PE	32										●			●
◈	**SABRE**	33	●		●	●		●					●		
—	SENCOR	34	●		●							●	●		●[n]
▽	**STAMPEDE 360**	36	●		●	●		●							
▽	STAMPEDE CM	37	●		●	●		●							
▽	**TARGET**	39	●		●	●									
◈	TCA/NaTa	38			●	●		●	●			●			
◈	**TORCH/TORCH DS**	40	●		●	●		●					●		
▽	TORDON 202-C	41	●		●										
—	**TREFLAN** SPRING FALL	42	·/·		·/·			·/·	·/·	·/·	·/·	·/·			·/·
▽	TROPOTOX/TROPOTOX PLUS	44	●		●	●	●								
◈	**2,4-D[1]**	46	●	●	●		●								

Poison Hazard
See Page 4 for safety procedures.

Danger ◈ Warning ▽ Caution
— No warning symbol required

X — CONTROLLED BY RATE GIVEN FOR CROP
T — TOP GROWTH CONTROL ONLY — NEW GROWTH WILL COME BACK FROM THE RO
S — SUPPRESSION ONLY
● — REGISTERED FOR USE IN THIS CROP

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Mataven (flamprop-methyl)

Activity: 84 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring except Selkirk, durum, winter), triticale, canary seed, sunflowers	5.0 L/ha
	5.0-7.5 L/ha (Use the high rate of application for banding)
Forage Crops Grown for Seed in Year of Seeding:	
Alfalfa	5.0 L/ha
Bromegrass, meadow fescue, creeping red fescue, Russian wild ryegrass, intermediate wheatgrass, crested wheatgrass	5.0-7.5 L/ha (Use the higher rate when grown without a companion crop)

Weed controlled: Wild oats.

Application:

Apply in 100 L of water/ha at a pressure of 300 kPa. Direct the spray pattern 45 degrees forward and adjust boom height to ensure uniform coverage. Optimum results can be expected when applied with flat fan nozzles.

Timing:

Apply when the majority of the wild oats are in the 3-6 leaf stage. Treatment at the 3-4 leaf stage will give the best combination of wild oat control and crop yield response. Do not apply to crop that is past the six leaf stage. Wild oats with less than three leaves will not be controlled.

Mode of Action:

Mataven kills most wild oat plants. Those that survive will be stunted and should not compete with the crop.

Precautions:

1. DO NOT mix Mataven with herbicides for broadleaf weed control as wild oat control will be reduced.
2. Allow an interval of 4 days between the use of Mataven and application of MCPA, Torch, Pardner, Torch/Pardner + MCPA, Buctril M, or Brominal M and an interval of seven days between the application of Mataven and 2,4-D or Banvel.
3. DO NOT graze treated areas.
4. DO NOT store below 0 degrees Celsius.
5. DO NOT apply if rainfall is expected within 2 hours.

Mixing:

DO NOT tank-mix with MATAVEN with other pesticides, fertilizers, or spray adjuvants.

Mecoturf, Compitox (mecoprop)

Activity: 150 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum), oats, barley	5.6-11 L/ha

Weeds controlled: Chickweed, corn spurry, cow cockle, cleavers.

Application:

Apply in 200 L of water per ha.

Timing:

For best results apply when the weeds are in the 2-4 leaf stage. Mecoprop can be applied safely to cereals from the 3-leaf stage to just before the flag-leaf stage.

Mode of Action:

Similar to 2,4-D and MCPA.

Precautions:

1. DO NOT feed treated fodder to livestock.
2. DO NOT use on cereals underseeded to legumes.
3. Rain shortly after application will reduce effectiveness.
4. DO NOT freeze.

Mixing:

DO NOT mix MECOTURF or COMPITOX with other pesticides, fertilizers or spray adjuvants.

Pardner (bromoxynil)

Activity: 225 g active ingredient/litre, 281 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum, winter), oats, barley, triticale, seedling grasses, fall rye	1.25-1.5 L/ha (225)/1.0-1.2 L/ha (281)
Canary seed	1.25 L/ha(225)/1.0 L/ha (281)

Weeds controlled: Green smartweed, lady's-thumb, wild mustard, kochia, cow cockle, lamb's-quarters, stinkweed, Russian thistle, wild buckwheat, tartary buckwheat, common buckwheat, common groundsel, cocklebur.

Application:

Apply bromoxynil in 100 L of water per ha at a pressure of 275 kPa.

Timing:

1. Bromoxynil can be safely applied in the spring to cereals from the 2-leaf stage until the appearance of the flag leaf. Best results are obtained from applications made at the early leaf stages.
2. Apply when seedling grasses are in 2-4 leaf stage. Apply to grasses in the year of establishment only, not underseeded to a legume. Grasses registered for treatment are bromegrass, timothy, slender wheatgrass, creeping red fescue, reed canarygrass, crested wheatgrass, orchardgrass, tall wheatgrass, intermediate wheatgrass, Russian wild ryegrass and meadow fescue.
3. Apply when broadleaf weeds are in the 1-4 leaf stage. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.

Mode of Action:

Bromoxynil is a contact herbicide. Therefore, thorough coverage of the weeds is required for good control.

Precautions:

1. DO NOT apply bromoxynil or mixtures containing bromoxynil during hot, humid weather as this may result in temporary leaf scorch.
2. There must be a 30 minute interval between application and rainfall.
3. DO NOT freeze.
4. There are no grazing restrictions.

Mixing:

1. Mix PARDNER at 1.25 L/ha (225) or 1.0 L/ha (281) with AVENGE 200-C at 3.5-4.25 L/ha to control wild oats and broadleaved weeds in barley and those varieties of wheat and fall rye registered for AVENGE 200-C. Apply in 100 L of water per ha when the wild oats are in the 3-5 leaf stage. Add the broadleaf herbicide at start of filling then fill tank to ¾ full and add AVENGE 200-C. Top off spray tank with remaining water.
2. Mix PARDNER at 1.25 L/ha (225) or 1.0 L/ha (281) with MCPA at 560-840 mL/ha in 100 L of water per ha to control a wide range of broadleaf weeds in wheat, winter wheat, oats and barley. PARDNER at 1.25 L/ha (225) or 1.0 L/ha (281) can also be tank-mixed with 2,4-D amine at 560-840 mL/ha or with 2,4-D LV ester (600 g active ingredient/L) at 470-700 mL/ha for broadleaf weed control in wheat and barley. Do not apply the tank mix with 2,4-D prior to the 4-leaf stage of the crop. To control hemp-nettle mix PARDNER at 1.25 L/ha with MCPA at 1.12 L/ha.
3. Mix PARDNER at 1.25 L/ha (225) or 1.0 L/ha (281) with HOE-GRASS at 3.75 L/ha (190) or 2.5 L/ha (284) to control grassy and broadleaved weeds in spring wheat and barley (except Betzes, Norbert, Klages). Apply in 100 L water per ha at a pressure of 275 kPa. Apply when the weeds are in the 1-3 leaf stage and before the grassy weeds have tillered. Do not apply to barley after the 4 leaf stage or more than 21 days after crop emergence. During periods of stress (i.e. very hot (28°C) and/or dry conditions or low humidity) plants are not actively growing. Better control of grassy weeds will be achieved if HOE-GRASS is applied alone rather than as a tank-mix with PARDNER under these conditions.

Poast (sethoxydim)*

Activity: 184 g active ingredient/litre

Registered Uses:
Crops
Canola, flax

Rate of Application (product) and Weeds controlled:
At 0.8 L/ha of product: Green and yellow foxtail (wild millet), barnyard grass, large crabgrass, volunteer corn, proso millet, fall panicum, witchgrass, Persian darnel; for extremely heavy infestations use 1 L/ha rate.
At 1.4 L/ha of product: All of the above plus wild oats; for extremely heavy infestations of wild oats, use 1.6 L/ha rate.
At 1.6 L/ha of product: All of the above plus volunteer wheat and volunteer oats.
At 1.9 L/ha of product: All of the above plus volunteer barley.

Application:
Apply in a water volume of 100 L/ha at minimum of 275 kPa pressure. For applications to dense weed infestations or dense crop canopies use 150 to 250 litres of water per hectare at pressures of 275 to 425 kPa. The use of 80° stainless steel flat fan nozzles is recommended for optimum spray coverage with nozzles tilted 45° forward to ensure better coverage. The use of flood jet or hollow cone nozzles is not recommended.
Assist Oil Concentrate must be added to all applications of Poast at a rate of 1 litre of Assist Oil Concentrate per hectare in 100 L of water per hectare.

Time of Application:
For optimum control apply at the 2-5 leaf stage when grasses are small and actively growing, and the crop is small enough to permit thorough spray coverage.

Mode of Action:
POAST is a contact and systemic herbicide. Uptake is primarily through the leaves and thorough coverage of the foliage is important for consistent grass control. Susceptible grasses stop growing and slowly turn brown. Complete control takes 7-21 days.

Precautions
1. Rainfall within 1 hour of application may reduce the effectiveness of the spray.
2. Allow 4 days between applications of Poast and any other pesticide.
3. DO NOT graze treated fields or harvest for feed prior to crop maturity.
4. When grasses are stressed due to drought, flooding or prolonged cool temperatures (15°C or less), control can be reduced or delayed.
5. **Avoid causing spray drift to susceptible cereal or grass crops** and wash sprayer thoroughly after use to avoid damage to susceptible crops.

Tank Mixing:
1. When mixing POAST the following is recommended: Half fill the spray tank with water and start continuous agitation. Add the correct amount of POAST, add the broadleaf herbicide if required, add the correct amount of Assist Oil Concentrate. Fill tank to required water level and spray. Continuous agitation is required. Avoid allowing spray mixture to sit overnight.
2. Mix POAST at the required rate with BUCTRIL-M (562) at 1.0 L/ha or BROMINAL-M (400) at 1.4 L/ha, or BROMINAL-M (450), BROMOX 450 M or BUCTRIL-M (450) at 1.25 L/ha to control grassy and broadleaf weeds in **flax.** Apply in a minimum 100 L of water per ha when grass weeds are in the 2-5 leaf stage and flax is 5-10 cm tall.
3. Mix POAST at the required rate with MCPA (amine or ester) at 560 mL/ha to control grassy and broadleaf weeds in **flax.** Apply after the flax is 5 cm tall and before bud formation.

* This product has a temporary registration. Additional technical information is required in relation to its use. Be advised that the current label may be revised. Directions for use and cautionary statements should be carefully followed.

Premerge 360, Sinox PE (dinoseb)

Activity: 360 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Peas, Fababeans	2.75-4.25 L/ha

Weeds controlled: Stinkweed, wild mustard, volunteer canola.

Application:
Apply in 100-200 L of water/ha during warm sunny weather when the crop plants are dry. Some leaf burn may occur. Spraying is more effective and less product can be used when temperatures are 21-29°C. To reduce the risk of crop damage do not apply at temperatures above 29°C or when the temperature is expected to exceed 29°C within 24 hours after spraying. Use the higher rates when temperatures are below 21°C. Add .45 kg of Calgon/450 L of water before adding the Premerge when using extremely hard water. **Do not overlap**.

Timing:
Apply when peas are 10-20 cm long and when fababeans have 2-4 leaves.

Mode of Action:
Dinoseb amine kills weeds by contact action. Annual broadleaved weeds are more susceptible than annual grass weed seedlings. Broadleaved weeds other than those in the mustard family will not be satisfactorily controlled at these rates.

Precautions:
Dinoseb is extremely toxic to humans. Follow all safety precautions on the label.

1. DO NOT graze animals on treated fields or feed treated hay to livestock within 40 days of treatment.
2. Light or moderate rainfall after treatment is desirable but heavy rain may cause excessive leaching of the chemical with resultant lower weed control.
3. DO NOT freeze.

Mixing:
Mix PREMERGE 360 at 2.7-4.2 L/ha with BASFAPON or DOWPON at 1.1-1.5 kg/ha or with TCA at 5.4 kg/ha to control mustard, stinkweed, volunteer canola, and green foxtail in peas. Apply in 100-200 L of water/ha when the peas are 10-20 cm long. Follow all precautions listed for PREMERGE 360.

Princep Nine-T (simazine)

Activity: 90% water dispersible granule

Registered Uses:

Crops	Recommended Rates (product)
Established alfalfa	1.1 kg/ha

Weeds controlled: Lady's-thumb, lamb's-quarters, purslane, ragweed, volunteer clover, wild buckwheat, smartweed, barnyard grass, wild oats, green foxtail.

Application:

1. Gentle agitation is required during mixing and spraying of the water dispersible granule. Use nozzle screens of 50 mesh size or larger. After any break in the spray application, agitate thoroughly.
2. Apply in 300 litres of water/ha.

Timing:
Apply in fall from September to freeze-up.

Mode of Action:
Princep acts through the roots of germinating weeds and inhibits photosynthesis.

Precautions:

1. DO NOT graze for 30 days or harvest for 60 days.
2. DO NOT plant any other crop into treated area, soil residues may persist for 2 or more years.
3. DO NOT overlap application.
4. DO NOT apply to the same field for more than 3 consecutive years.
5. DO NOT apply gramoxone within one year after the Princep application.

Mixing:
DO NOT tank-mix PRINCEP NINE-T with any other heribcides, fertilizers or spray adjuvants.

Sabre (bromoxynil & MCPA mixture)

Activity: bromoxynil and MCPA (1:1) 720 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum), barley, oats, canary seed	780 mL/ha

Weeds controlled: Wild buckwheat, tartary buckwheat, common buckwheat, green smartweed, pale smartweed, lady's-thumb, redroot pigweed, lamb's-quarters, ball mustard, wild mustard, tumbling mustard, volunteer rapeseed, cow cockle (seedling to 4 leaf stage), Russian thistle (seedling to 5 cm high), stinkweed, blue bur, common ragweed, flixweed, shepherd's purse, scentless chamomile (spring annuals only), volunteer sunflower, top growth control of Canada thistle and perennial sow-thistle.

Application

For ground application apply in 100 L/ha of water at a pressure of 275 kPa and a ground speed of 6.5-8 km/h. Continuous agitation is required.

Timing:

Spray before weeds are past the 5 leaf stage. For wheat, barley and oats spray from the 2 leaf stage to early flag stage of the crop. Do not apply during or after the boot stage. Treat when flax is 5-10 cm high. Treat canary seed from the 3-5 leaf stage.

Mode of Action

Bromoxynil is a contact herbicide. Therefore, thorough coverage of the weeds is required for good control.

Precautions

1. In flax, some leaf burn and retarded growth may delay maturity 2-3 days. Severe injury may result if flax is treated when the plants are under stress. Do not spray in hot, humid weather or when daytime temperature is over 29°C.
2. DO NOT apply SABRE during hot, humid weather as this may result in temporary leaf scorch.
3. There must be a 30 minute interval between application and rainfall.
4. SABRE does not require heated storage.
5. There are no grazing restrictions.

Tank Mixing:

1. In barley and certain varieties of wheat (Gleanlea, Columbus, Leader, Neepawa, Chester, Macoun, Selkirk, Canuck, Benito) for control of wild oats and broadleaf weeds mix SABRE at .780 L/ha with AVENGE at 3.5-4.2 L/ha. Spray wild oats between the 3 to 5 leaf stage. Use 100 L of water per hectare.
2. For control of hemp-nettle and top growth of Canada Thistle and Sow Thistle in wheat, barley and oats mix SABRE at .780 L/ha with MCPA ester (500 g active ingredient/ha) at .55 L/ha. Spray hemp-nettle from the 2 to 4 leaf stage, and use 100 litres of water per hectare.

Sencor 75 DF, Sencor 500 (metribuzin)

Activity: Sencor 75DF — 75% dry flowable
Sencor 500 — 500 g active ingredient/litre

Registered Uses: Crops	**Sencor 75DF**	**Recommended Rates (product) Sencor 500**
Barley (except Klondike)	200-375 g/ha	425-550 mL/ha
Wheat (spring, durum)	200-275 g/ha	425 mL/ha
Lentils	275 g/ha	425 mL/ha
Field peas	275-375 g/ha	425-550 mL/ha
Fababeans	Sencor + Treflan (tank-mix only)	(See tank-mix section below)

Weeds controlled: Hemp-nettle, chickweed, corn spurry, lamb's-quarters, stinkweed, volunteer canola, wild mustard, tartary buckwheat, ball mustard, smartweed, lady's-thumb. Wild buckwheat is not controlled. Use the higher rate for best residual control of chickweed and hemp nettle or when weed infestation is heavy.

Application:
Apply in 100 L of water/ha. Sprayer should be equipped with tips no finer than 6502, 8002, or LF2, nozzle screens no finer than 50 mesh and 50 mesh or larger line strainers. A pump of sufficient capacity to provide adequate volume through the by-pass and/or jet agitation system is essential. Crop must be seeded at least 5 cm deep.

Timing:
Apply when the cereal crop is in the 2-5 leaf stage. Early application of Sencor to lentils or peas (prior to 15 cm vine length) in 170 L of water/ha reduces risk of crop injury. Do not use on lentils or peas seeded less than 5 cm deep or in soils with less than 4% organic matter. Allow 3 days after cool, wet weather before application of Sencor to lentils or peas.

Mode of action:
Sencor is a systemic herbicide and kills susceptible plants by inhibiting photosynthesis. Control may not be noticeable for 7-10 days after treatment.

Precautions:
1. Sencor may be applied when the crop is wet with dew but weed control may be reduced if there is rainfall within 6 hours after application.
2. Initial temporary (7-10 days) lightening in crop color and occasionally a slight reduction in crop height may occur especially if frost or abnormally high temperatures occur within 1-2 days of application. If frost occurs prior to application, allow 4-5 days for crop to recover before applying Sencor.
3. DO NOT use on crops underseeded to forages.
4. DO NOT graze or feed treated crops to livestock within 30 days of application. Do not harvest for grain within 60 days of application.
5. Continuous agitation is required during spraying. Do not let spray mixture stand without agitation or settling may occur.
6. Allow a 4-5 day interval between application of Sencor and wild oat herbicides.

Mixing:
1. Mix SENCOR 500 at 400-550 mL/ha on barley and SENCOR 500 at 400 mL/ha on wheat with MCPA amine at .84-1.1 L/ha when the crop is in the 3-5 leaf stage.
2. Mix SENCOR 500 at the above rates with BANVEL LH at 275 mL/ha on wheat and barley when the crop is in the 2-3 leaf stage. DO NOT apply to Klondike barley.
3. For broadleaf and grassy weed control in fababeans mix SENCOR 75DF at 550 g/ha or SENCOR 500 at 850 mL/ha with TREFLAN at 2.0-2.5 L/ha for fall application. For spring application mix SENCOR 75DF at 375-550 g/ha or SENCOR 500 at 550-850 mL/ha with TREFLAN at 1.5-2.0 L/ha. Apply fall or spring (before planting) in 100 L of water and incorporate immediately following the recommendations for Treflan incorporation.
4. Mix SENCOR 500 at 275 to 425 mL/ha with TARGET at 1.0 to 1.5 L/ha to control broadleaf weeds in wheat and barley in the 2-3 leaf stage. Application of this tank-mix at later crop stages may result in reduced crop tolerance especially if the crop is under stress.

Sinbar (terbacil)

Activity: 80% wettable powder

Registered Uses:

Crop	Recommended Rates (product)
Alfalfa (established at least 1 year)	0.7-1.5 kg/ha

Weeds controlled: Annual bluegrass, annual sow-thistle, barnyard grass, chickweed, downy brome, green foxtail, lamb's-quarters, mustard, perennial ryegrass, pigweed, prickly lettuce, purslane, ragweed, shepherd's-purse, stinkweed, wild barley.

Application:

1. Apply in a minimum 200 L of water/ha.
2. Use lower rate on lighter soil (sandy loams, loams) and higher rates on heavier soils (clay loams, clays).
3. When using a wettable powder certain precautions and sprayer adjustments must be made to ensure that it is applied correctly. Be sure that the sprayer is equipped with 50 mesh line strainers and screens. Stainless steel or hardened stainless steel nozzles are recommended. Also, pumps must be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.

Timing:

Apply after alfalfa goes dormant in the fall or before new growth starts in the spring. Do not apply after new growth starts, as crop injury may result.

Mode of Action:

Sinbar must be moved into the root zone of weeds with moisture where it can be absorbed by the root system. Once in the plant, it strongly inhibits photosynthesis.

Precautions:

1. DO NOT use on soils containing less than 1% O.M.
2. DO NOT replant to any crop within 2 years after last application as injury may result.
3. DO NOT overlap spray swaths.
4. Moisture is necessary to activate the chemical.
5. Thoroughly clean all traces of Sinbar from application equipment immediately after use.

Mixing:

DO NOT tank-mix SINBAR with other herbicides, fertilizers or spray adjuvants.

Stampede 360 (propanil)

Activity: 360 g active ingredient/litre

Registered Uses:	**Recommended Rates (product)**
Crops	
Wheat (spring, durum), barley, oats, flax	2.75 L/ha

Weeds controlled: Green foxtail (wild millet, pigeon grass), yellow foxtail, wild buckwheat, tartary buckwheat, redroot pigweed, lamb's-quarters, stinkweed (rosette stage), shepherd's-purse, bluebur, smartweed, lady's-thumb.

Application:
Apply in 100 L of water/ha using flat fan nozzles (e.g. LF2-80 degrees, 8002, 6502, LF2-65 degrees, etc.) and 275 kPa. Use 50 mesh screens in nozzles and pump. Maintain a three-day interval between application of Stampede 360 and other herbicides. Application may be made with floater-type equipment, with best results at 150 L water/hectare and 275 kPa and at speeds not in excess of 16 km/h. Application by aircraft or other low volume equipment is not recommended.

Timing:
Apply when the majority of green foxtail is in the 3-leaf stage and less than 2.5 cm in height. Broadleaved weeds should be in the 2-4 leaf stage. Under dry conditions (more than 5 cm of dry soil at the surface), apply when green foxtail is in the 2-3 leaf stage, since control of green foxtail at the 4-leaf stage and beyond will not be satisfactory under dry soil conditions.

Apply when cereal crops are in the 2-5 leaf stage. Apply to flax at least 5 cm but not more than 12 cm in height. Do not spray flax when the temperature exceeds 30 C. Under stress conditions, suppression of flax growth immediately after treatment and some delay in maturity can be expected.

Mode of Action:
Stampede is a contact herbicide, therefore, thorough coverage of the weeds and proper timing are important. Note: Stampede may cause temporary crop yellowing or leaf-tip burn 2-5 days after application.

Insecticides:
Furadan may be used for grasshopper control in wheat if applied at least 5 days after Stampede 360. Allow at least 10 days in barley. For Cygon or malathion allow 14 days after an application of Stampede 360. Crops grown from seed protected with dual purpose seed dressings may be treated with Stampede.

Precautions:
1. DO NOT apply to crops under severe drought stress.
2. DO NOT use water that is colder than 10°C.
3. Spray out Stampede 360 within 6 hours of mixing to prevent crystallization on screens. Empty and wash out spray tank after each day's spraying.
4. Stampede 360 may be stored at freezing temperatures but must be returned to its original state by warming to room temperature (20-22°C) and agitating thoroughly on several successive days before use.
5. DO NOT spray if rainfall is expected within 1 hour.
6. There are no grazing restrictions.

Mixing:
1. Mix **STAMPEDE** 360 at 2.75 L/ha with **MCPA ESTER** at 550 mL/ha in 100 L of water/ha to control a wider spectrum of broadleaf weeds than Stampede 360. Apply to wheat (including durum), barley and oats when they are in the 2-5 leaf stage and to flax when it is 5-12 cm high. **STAMPEDE** 360 at 2.75 L/ha can also be tank-mixed with 2,4-D AMINE at 1.2 L/ha or 2,4-D **LV ESTER** (600 g active ingredient/litre) at 660 mL-1.0 L/ha in 100 L of water/ha to control a wider spectrum of broadleaf weeds, including Russian thistle, than Stampede 360. Apply to wheat only when it is in the 4 to 5 leaf stage. Use the low rate of 2,4-D ester for durum wheat.
2. Always add 2,4-D or MCPA to the spray tank prior to adding Stampede 360.
3. **DO NOT** tank-mix Stampede 360 with any other pesticides (except as recommended), fertilizers or additives. A 3-day interval should be allowed before or after application of Stampede 360 and any other herbicide.

Stampede CM (propanil and MCPA ester 7:2)

Activity: 460 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Barley, oats, flax, wheat (spring, durum)	2.75 L/ha

Weeds controlled: Green foxtail (wild millet, pigeon grass), yellow foxtail, lady's-thumb, smartweed, lamb's-quarters, redroot pigweed, wild buckwheat, tartary buckwheat, bluebur, wild mustard, stinkweed, shepherd's-purse, volunteer canola, kochia, flixweed.

Application:

Apply in 100 L of water/ha using flat fan nozzles (e.g. LF2-80 degrees, 8002, 6502, LF2-65 degrees, etc.) and 275 kPa. Use 50 mesh screens in nozzles and pump. Maintain a 3-day interval between application of Stampede CM and other herbicides. Application may be made with floater-type equipment, with best results at 150 L water/hectare and 275 kPa and at speeds not in excess of 16 km/h. Application by aircraft or other low volume equipment is not recommended.

Timing:

Apply when the majority of green foxtail are in the 3-leaf stage and less than 2.5 cm in height. Broadleaved weeds should be in the 2-4 leaf stage. Under dry conditions (more than 5 cm of dry soil at the surface), apply when green foxtail is in the 2-3 leaf stage, since control of green foxtail at the 4-leaf stage and beyond will not be satisfactory under dry soil conditions.

Apply when the cereal is in the 2-5 leaf stage. Apply to flax when it is at least 5 cm tall but not more than 12 cm tall. Do not spray flax when the temperature exceeds 30°C. Under stress conditions, suppression of flax growth immediately after treatment and some delay in maturity can be expected.

Mode of Action:

Stampede CM is a contact herbicide, therefore thorough coverage of the weeds and proper timing are essential. Stampede CM may cause temporary crop yellowing or leaf tip burn 2-5 days after application. Under normal growing conditions these effects are temporary and new growth is normal.

Insecticides:

Furadan may be used for grasshopper control in wheat if applied at least 5 days after Stampede CM. Allow at least 10 days in barley. For Cygon or malathion allow 14 days after an application of Stampede CM. Crops grown from seed protected with dual purpose seed dressings may be treated with Stampede.

Precautions:

1. DO NOT apply to crops under drought stress.
2. DO NOT use water that is colder than 10°C.
3. Spray out Stampede CM within 6 hours of mixing to prevent crystallization on screens. Empty and wash out spray tank after each day's spraying.
4. Stampede CM may be stored at freezing temperatures but must be returned to its original state by warming to room temperature (20-22°C) and agitating thoroughly on several successive days before use.
5. DO NOT apply if rain is expected within 1 hour.
6. There are no grazing restrictions.

Mixing:

DO NOT tank-mix STAMPEDE CM with other herbicides, insecticides, fertilizers or spray adjuvants (wetting agents). A three day interval should be allowed before or after application of Stampede CM and any other herbicide.

TCA, NaTA, Sodium TCA Solution (TCA)

Activity: TCA/NaTA 850 g active ingredient/kg
TCA Solution 41.5% (415 g active ingredient/litre)

Registered Uses: Crops	Recommended Rates (product)
Barley	TCA 1.3 kg/ha, TCA Solution 2.0 L/ha
Oats	TCA 1.3-2.7 kg/ha, TCA Solution 2.0-3.75 L/ha
Canola	TCA 2.7-5.4 kg/ha, TCA Solution 5.5-9.0 L/ha
Flax	TCA 4.0-5.4 kg/ha, TCA Solution 5.5-9.0 L/ha
Peas (field)	TCA 5.4 kg/ha, TCA Solution 5.5-9.0 L/ha

Weeds controlled: Green and yellow foxtail.

Application and Timing:

1. Use the lower rate on light, sandy soils.
2. Barley and Oats — apply in 90-100 L of water per ha when the weeds have 1-3 leaves and the crop has 2-4 leaves.
3. Canola and Flax — apply in 100-165 L of water per ha before the weeds have 4 true leaves. Canola should be in the 2-4 leaf stage. Flax should be 10-15 cm tall.
4. Peas — apply in 100-160 L of water per ha when weeds are in the 1-3 leaf stage and pea vines are 10-15 cm long.

Mode of Action:

1. TCA acts mainly through the soil so activity will be greatest on sandy soil and under good moisture conditions.
2. TCA inhibits growth of the weeds. Rates recommended for cereals will severely stunt green foxtail but do not usually give complete kill.
3. Delay in barley and oat maturity may occur.

Precautions:

1. Oats and barley should be seeded 5 cm deep or deeper to reduce chances of crop injury.
2. Flush the sprayer thoroughly after each use.
3. Adequate agitation and gradual addition of material to spray tank is needed during mixing to completely dissolve TCA. Pre-dissolve TCA in a small amount of warm water to ensure quick and complete mixing.
4. DO NOT graze treated areas for at least 24 hours after treatment.
5. Use 50 mesh screens and filters. Stainless steel or hardened stainless steel nozzle tips are recommended. Pumps should be of sufficient capacity for adequate agitation through the by-pass or jet agitator which should terminate in the bottom of the tank.
6. A light rain after application is beneficial.

Mixing:

1. Mix TCA at 1.3 kg/ha with 2,4-D AMINE up to 1.1 L/ha to control broadleaf weeds and green foxtail in barley. Apply at the 4 leaf stage of the crop when the weeds are in the 1-3 leaf stage. Use 100 L of water/ha. Completely dissolve TCA in water before adding 2,4-D. Flush sprayer tank thoroughly with water after applying TCA.
2. Mix TCA at 1.3 kg/ha in barley, 1.3-2.7 kg/ha in oats and 4.5 kg/ha in flax and peas, with MCPA AMINE up to 1.1 L/ha or MCPA SODIUM SALT up to 1.9 L/ha to control broadleaf weeds and green foxtail. Apply when the cereal is in the 1-4 leaf stage, peas are 10-20 cm tall, flax is 5-10 cm tall and the weeds are in the 1-3 leaf stage. Use the lower rate of TCA on sandy soils. Apply in 100 L of water/ha. Completely dissolve TCA in water before adding MCPA. Flush sprayer tank thoroughly with water after applying TCA.
3. Mix TCA at 5.4 kg/ha with PREMERGE 360 at 2.7-4.2 L/ha to control mustard, stinkweed, volunteer canola, and green foxtail in peas. Apply in 100-200 L of water/ha when the peas are 10-20 cm long. Follow all precautions listed for PREMERGE 360.
4. Mix TCA at 5.4 kg/ha with TROPOTOX at 4.2 L/ha to control broadleaf weeds and green foxtail in peas. Apply in 150-200 L of water/ha when the peas have 3-6 expanded leaves.

Target (dicamba + mecoprop + MCPA)

Activity: 400 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Wheat (spring, durum), barley, oats	1.0-1.5 L/ha

Weeds controlled: Hemp-nettle*, wild buckwheat, annual smartweed species, Russian thistle, sow-thistle, corn spurry, knotweed, volunteer buckwheat, ragweed, stinkweed, mustards (except dog mustard), pigweeds (prostrate, redroot), lamb's-quarters, cow cockle, tartary buckwheat, flixweed, shepherd's-purse, top growth control of Canada thistle and field bindweed.

* Suppression only

Application:

Use at least 100 L of water/ha to reduce the risk of crop injury.

Timing:

1. Spray at the 3-4 leaf stage of wheat and oats and the 3 leaf stage of barley. Treatment at the 3 leaf stage of the crop will usually combine maximum crop tolerance and weed susceptibility.
2. Application at higher rates or after the 4 leaf stage or at low water volumes will usually result in stem bending and delayed maturity. Under conditions conducive to prolific tillering, the yield may also be reduced. Very severe yield losses due to sterility will result from treatment during the flag leaf to the early heading stage.

Mode of Action:

Target is a translocated herbicide which affects the roots of the plant. It is slower acting than most other broadleaf herbicides and death of the plants may take 2-3 weeks.

Precautions:

1. DO NOT use on cereals underseeded to legumes.
2. DO NOT freeze.
3. DO NOT apply if rainfall is expected within 3 hours.
4. DO NOT graze or harvest for livestock feed prior to crop maturity.

Mixing:

1. Mix TARGET at 1.0-1.5 L/ha with SENCOR 500 at 275-425 mL/ha for control of chickweed and other broadleaf weeds in wheat and barley. Application of this tank-mix at late crop stages may result in reduced crop tolerance especially if the crop is under stress. Do not use this tank-mix on oats. Do not apply to KLONDIKE barley.
2. Mix TARGET at 1.0-1.5 L/ha with AFOLAN F at 470 mL/ha or LOROX L at 425 mL/ha for control of chickweed and other broadleaf weeds in wheat, oats and barley.

Torch, Torch DS (bromoxynil)

Activity: Torch 227 g active ingredient/litre
Torch DS 450 g active ingredient/litre

Registered Uses Crops	Recommended Rates (product) Torch	Torch DS
Wheat (spring, durum), barley, oats, triticale, canary seed	1.25-1.5 L/ha	625-750 mL/ha
Flax	1.25 L/ha	625 mL/ha
Seedling grasses	1.75 L/ha	875 mL/ha

Weeds controlled: Wild buckwheat, tartary buckwheat, lady's-thumb, green smartweed, cow cockle, kochia, common groundsel, knawel, Russian thistle, stinkweed, lamb's-quarters, wild mustard, redroot pigweed, night-flowering catchfly, scentless chamomile (seedling only).

Application:

Apply bromoxynil in 100 L of water per ha at a pressure of 275 kPa. Continuous agitation is required when using TORCH DS.

Timing:

1. Bromoxynil can be safely applied to cereals from the 2-leaf stage until the appearance of the flag-leaf and to flax when the crop is 5-10 cm tall. Best results are obtained from applications made at the early leaf stages.
2. Apply when seedling grasses in 2-4 leaf stage. Apply to grasses in the year of establishment only, not underseeded to a legume. Grasses registered for treatment are bromegrass, timothy, slender wheatgrass, creeping red fescue, reed canarygrass, crested wheatgrass, orchardgrass, tall wheatgrass, intermediate wheatgrass, Russian wild ryegrass and meadow fescue.
3. Apply when broadleaf weeds are in the 1-4 leaf stage. Stinkweed and wild mustard must be sprayed at a very early stage for optimum control.

Mode of Action:

Bromoxynil is a contact herbicide. Therefore, thorough coverage of the weeds is required for good control.

Precautions:

1. In flax, some leaf burn and retarded growth may delay maturity 2-3 days. Severe injury may result if flax is treated when the plants are under stress.
2. DO NOT apply bromoxynil or mixtures containing bromoxynil during hot, humid weather as they may result in temporary leaf scorch.
3. There must be a 30 minute interval between application and rainfall.
4. DO NOT freeze Torch.
5. Torch DS does not require heated storage.
6. DO NOT graze seedling grasses in the season in which they have been sprayed with bromoxynil.

Mixing:

1. Mix TORCH at 1.25 L/ha or TORCH DS at 625 mL with AVENGE 200-C at 3.5-4.25 L/ha to control broadleaf weeds and wild oats in barley and Glenlea, Neepawa, Chester, Macoun, Selkirk, Canuck, Columbus, Leader or Benito wheat. Apply in 100 L of water per ha when the wild oats are in the 3-5 leaf stage. Add the broadleaf herbicide at start of filling then fill tank to ¾ full and add AVENGE 200-C. Top off spray tank with remaining water.
2. Mix TORCH at 1.25 L/ha or TORCH DS at 625 mL with MCPA at 560-840 mL/ha in 100 L of water per ha to control a wide range of broadleaf weeds in wheat, oats and barley. In flax mix with MCPA at 560 mL/ha. Do not apply to flax in hot, humid weather. Cereal crops can be treated safely from the 2-leaf stage up to the flag stage. Add MCPA to water first. TORCH at 1.25 L/ha or TORCH DS at 625 mL/ha can also be tank-mixed with 2,4-D amine at 560-840 mL/ha or with 2,4-D ester (600 g active ingredient/L) at 470-700 mL/ha for broadleaf weed control in wheat and barley. Do not apply the tank mix with 2,4-D prior to the 4-leaf stage of the crop. To control hemp-nettle mix TORCH at 1.25 L/ha or TORCH DS at 625 mL/ha with MCPA amine at 1.12 L/ha.
3. Mix TORCH at 1.25 L/ha or TORCH DS at 625 mL/ha with HOE-GRASS at 3.75 L/ha (190) or 2.5 L/ha (284) to control grassy and broadleaved weeds in spring wheat, barley (except Betzes, Norbert, Klages) and flax. Apply in 100 L of water/ha at a pressure of 275 kPa. Apply when the weeds are in the 1-3 leaf stage and before the grassy weeds have tillered. Do not apply when flax is less than 5 cm tall. Do not apply to barley after the 4 leaf stage or more than 21 days after crop emergence. During periods of stress (i.e. very hot (28°c) and/or dry conditons or low humidity) plants are not actively growing. Better control of grassy weeds will be achieved if Hoe-Grass is applied alone rather than as a tank-mix with TORCH under these conditions.

Tordon 202-C (picloram + 2,4-D, 1:16)*

Activity: 212 g active ingredient/litre

Registered Uses:

Crops	Recommended Rates (product)
Barley, Wheat (spring, durum)	1.5-2.0 L/ha

Weeds controlled: 1.5 L/ha — Russian thistle, redroot pigweed, lamb's-quarters, spring stinkweed seedlings, cocklebur, dandelion seedlings, wild mustard.

2.0 L/ha — wild buckwheat, green smartweed, tartary buckwheat, Canada thistle top growth, perennial sow-thistle top growth.

Application and Timing:

Apply in a minimum of 100 L of water per ha. Spray at 210-280 kPa.

Timing:

Apply when the crop is in the 3-5 leaf stage.

Mode of Action:

Picloram is a growth regulator type herbicide and is absorbed by both roots and leaves and is translocated to all parts of the plant. It can remain active in the soil throughout the growing season and will control some late germinating weeds. The weeds will not die immediately after treatment. The rate of growth will slow and gradually cease and therefore not compete with the crop growth or interfere with harvest. Wheat straw may be shortened slightly.

Precautions:

1. Rapeseed, mustard, canary seed, flax, rye, wheat, barley, oats, triticale, corn, sorghum or any grass seed can be grown on land treated with Tordon 202C in previous years. However, severe legume damage can result if barley or wheat crops underseeded to legumes are treated or if susceptible crops such as sunflowers, lentils, fababeans, beans, peas or potatoes are seeded in the treated field for a minimum of 3 years after treatment. It is recommended that a field bioassy using the susceptible crop(s) be undertaken the year prior to commercial production by seeding test strips of the susceptible crop(s) into the treated area and carefully observing growth and seed set. Pulse crop producers should carefully consider the long term effects on crop rotations before choosing this product.
2. **Tordon is a very potent herbicide. Do not allow spray drift to contact sensitive crops or other desirable vegetation. Do not contaminate nontarget land areas, cropland, water, irrigation or drainage ditches.**
3. Straw from treated fields should be returned to the field to which application was made. While straw from treated fields can be fed to animals, **do not** use manure from animals fed treated straw on fields used to grow sensitive crops. **Do not** allow animals to graze treated field within 2 weeks of treatment.
4. DO NOT apply if rainfall is expected within 6 hours.
5. DO NOT freeze.

Sprayer Clean-up Procedures:

1. **Drain and flush the spray system with clean water in an area well away from sensitive crops or trees.**
2. **Fill the system with a mixture of household ammonia and water; circulate the mixture through the system for five minutes, then let stand for 24 hours.**
3. **Drain the system and flush with clean water before use with other pesticides.**

Mixing:

DO NOT tank-mix TORDON 202C with any other herbicides or spray additives.

***Warning** — "Safety data and registration of this product are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using".

Treflan EC, QR5 (trifluralin)

Activity: Treflan EC 545 g active ingredient/litre
Treflan QR5 5% granules

Registered Uses:

Crops	Recommended Rates (product)		
	Fall Granular	**Fall Liquid**	**Spring Liquid**
Canola, sunflowers, peas, mustard, fababeans	22-28 kg/ha	2.0-2.6 L/ha	1.5-2.0 L/ha
Flax, lentils	22-28 kg/ha	2.0-2.6 L/ha	Not Recommended
Wheat (spring, durum), barley			1.1-1.5 L/ha

Summer Application: flax and canola only — 3.0 L/ha, 34 kg/ha (QR5)

Weeds controlled: Wild oats, green and yellow foxtail (wild millet), barnyard grass, wild buckwheat, cow cockle, redroot pigweed, lamb's-quarters, Russian thistle, chickweed, purslane, knotweed, Persian darnel.

Note: Rates recommended for barley and wheat will control **green foxtail (wild millet) only.**

Application and Timing:

1. Use the lower rate on light sandy soils or soils with less than 6% organic matter. Use the higher rate on heavier soils (loams and clays) and all soils with 6-15% organic matter.
2. Do not apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more than 15% organic matter, or soils that are subjected to prolonged periods of flooding.
3. Fields should be cultivated to destroy existing growth before applying Treflan liquid. When applying to stubble fields, chop and thoroughly mix crop residues into the soil to a depth of 10-15 cm. Disc type implements provide best results.
4. Apply Treflan EC in 100 L of water/ha.
5. The granular formulation is best suited for use under trashy conditions and is recommended for **Summer and Fall application only.** If soil is hard or if trash cover is very heavy, precultivation is necessary to ensure adequate mixing of the granules in the soil. For best results the second incorporation should be done before spring. Incorporate as outlined below for summer and fall applications.

Spring — apply and incorporate once immediately. The second incorporation must be done as soon as possible, preferably within 24 hours.

Fall — apply between September 1 and freeze-up. Incorporate immediately. It is preferred to do both incorporations in the fall, followed by shallow tillage in the spring prior to planting. However one incorporation may be done in the fall and the second in the spring to a depth of 8-10 cm.

Summer — apply between June 1 and Sept. 1 and incorporate immediately. Second and subsequent incorporations may be done any time prior to soil freeze-up.

Incorporation:

For Oilseed, Vegetable and Nursery Crops — Incorporate immediately. The first incorporation is best done in combination with the application operation and should not be delayed more than 8 hours after application. Two operations at right angles are required. When applied in the summer or fall, the second incorporation can be delayed until spring although two fall incorporations are preferred. When both incorporations are done in the fall, a shallow cultivation is required in the spring prior to planting.

Use a tandem disc, discer or vibrashank cultivator set to cut 8-10 cm deep. Operate disc implements at 7-10 km/h and cultivators at 10-13 km/h. Rod-weeders, harrows or hoe-drills, deep tillage cultivators or chisel plows will not properly incorporate Treflan.

Special Instructions for Flax:

a. Both incorporations should be completed before freeze-up in the fall prior to seeding flax the next spring.

b. **Work the seedbed to a shallow depth and pack just prior to seeding to ensure a firm seedbed and accurate planting depth. Use a double disc press or hoe press drill. Seed into a moist seedbed no more than 4 cm deep. Do not seed into cold soil. Seeding should generally be delayed until at least May 15. Conditions which result in slow germination and emergence will greatly increase the risk of a poor flax stand.**

For Cereals — Spring application of Treflan EC in wheat and barley for control of green foxtail (wild millet) only.

1. Seed crop 5-7.5 cm deep.
2. Apply Treflan as soon as possible after seeding (before crop emergence). The soil surface should be free of trash.
3. Shallow incorporate with two passes of diamond or tine harrows in different directions at speeds of 8 km/hr. Application and first incorporation should be done in the same operation if possible. The second incorporation must be completed within 8 hours of application.

Mode of Action:

Treflan controls susceptible weeds by killing seedlings as they germinate. It does not control established weeds.

Precautions:

1. DO NOT use on oats, rye, triticale or forage grasses.
2. Wheat and barley will likely be injured if seeded through a treated layer or into a deeply incorporated layer of Treflan.
3. DO NOT apply to peat or muck soils, wet soils, soils in poor working condition or soils which contain more than 15% organic matter.
4. Oats, canary seed and forage grasses should not be grown in rotation following a Treflan-treated crop.
5. Used as directed, and under normal conditions, Treflan will not harm the treated crop. However, seedling disease, cold weather, deep planting, excessive moisture, high salt concentration or drought may weaken crop seedlings and increase the risk of damage resulting in delayed crop development or reduced yields.
6. If allowed to freeze, Treflan liquid must be warmed to 15 degrees Celsius for 24 hours and shaken well before use.
7. With Treflan granules, avoid concentrating the material in narrow bands. Use a properly calibrated granule applicator that will apply the Treflan granules uniformly.
8. There are no grazing restrictions.
9. Treflan 5% granules (HERITAGE 5G). This product is registered for control of green foxtail in summerfallow to be seeded to wheat the following spring. However, sufficient data are not available on weed control or succeeding crop tolerance to make recommendations.
10. Treflan QR5 granules is registered for fall application to be seeded to barley the following spring. However, sufficient data are not available on succeeding crop tolerance to make recommendations.

Mixing:

1. Mix TREFLAN (liquid formulation) at 1.1 L/ha on light soils and 1.5 L/ha on medium to heavy soils with AVADEX BW (liquid formulation) at 3.5 L/ha in wheat or 3.5-4.2 L/ha in barley for control of wild oats and green foxtail (wild millet). Use only on fields free of trash. Apply in 100 L of water/ha after seeding and incorporate with a double harrowing at right angles. Seed should be placed 5-7.5 cm deep.
2. Mix TREFLAN at 1.5-2.0 L/ha with AMIBEN at 9.25 L/ha to control wild mustard, stinkweed and Treflan susceptible weeds in sunflowers. Use the lower rate of Treflan on sandy soils. Apply in the spring before planting using a minimum of 100 L of water/ha. Incorporate immediately according to recommendations for Treflan in oilseed crops. Field experience indicates that very hard water may cause compatability problems with AMIBEN.
3. For broadleaf and grassy weed control in fababeans mix TREFLAN at 2.0-2.6 L/ha for fall application with LEXONE DF at 400-550 g/ha or SENCOR 75 DF at 550 g/ha or SENCOR 500 at 850 mL/ha. For spring application mix TREFLAN at 1.5-2.0 L/ha with LEXONE DF at 350-550 g/ha or SENCOR 75 DF at 375-550 g/ha or SENCOR 500 at 550-850 mL/ha. Apply fall or spring (before planting) in 100 L of water and incorporate immediately following the recommendations for Treflan incorporation.

Note: Speeds in excess of 8 km/h will result in excessive pulverization and trash reduction leaving fields susceptible to erosion. The maximum recommended tillage depth for Saskatchewan is 10 cm.

Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation could result in soil erosion.

Tropotox (MCPB) Tropotox Plus (MCPB + MCPA 15:1)

Note: These products are recommended for use on cereals underseeded to legumes (excepi sweet clover)

Activity:

Tropotox	400 g active ingredient/litre
Tropotox Plus	400 g active ingredient/litre

Registered Uses:

Crops
Wheat (spring, durum), barley, oats, rye, seedling clover (white, alsike, red) pastures
Peas

Recommended Rates (product)
Tropotox Plus 2.75-4.25 L/ha

Tropotox 3.5-4.25 L/ha

Weeds controlled by Tropotox: Stinkweed, lamb's-quarters, redroot pigweed, ragweed, shepherd's-purse. Top growth control: Bull thistle, Canada thistle, curled dock, plantain, wild radish, hemp-nettle, annual sow-thistle, perennial sow-thistle, field bindweed.

Weeds controlled by Tropotox Plus: Weeds controlled by Tropotox and mustards.

Application and Timing:

1. Apply in 150-200 L of water per ha when the legumes are in the 1-4 true leaf stage and when the cereal is between the 4 leaf and flag leaf stages.
2. Apply when peas have 3-6 expanded leaves.
3. Apply in pastures after grazing or cutting when weeds are at a susceptible stage.

Mode of Action:
Mode of action is similar to 2,4-D and MCPA.

Precautions:

1. DO NOT use on sweet clover.
2. Rainfall before foliage has dried from spraying may decrease activity.
3. DO NOT freeze Tropotox or Tropotox Plus.
4. There are no grazing restrictions.

Mixing:
Mix TROPOTOX at 4.2 L/ha with BASFAPON or DOWPON at 1.1-1.5 L/ha or with TCA at 5.4 kg/ha to control broadleaf weeds and green foxtail in peas. Apply in 150-200 L of water/ha when the peas have 3-6 expanded leaves.

Wypout, Wypout 250 (barban)*

Activity: Wypout 125 g active ingredient/litre
Wypout 250 240 g active ingredient/litre

Registered Uses: Crops	Recommended Rates (product) Wypout	Wypout 250
Wheat (spring, durum)	2.25-2.8 L/ha	1.0 L/ha
Barley, Flax	2.25-2.8L/ha	1.0-1.5 L/ha
Mustard, canola, lentils peas, sunflowers, fababeans	2.25 -3.4 L/ha	1.0-1.75 L/ha
Alfalfa, sweet clover, red clover, bromegrass, Russian wild ryegrass	2.25-3.4 L/ha	1.0-1.75 L/ha
Seedling grasses for seed only (Timothy, creeping red fescue, crested wheatgrass)	2.25-3.4 L/ha	1.0-1.75 L/ha
Alsike clover	2.25-3.4 L/ha	Not Recommended

Weeds controlled: Wild oats.

Application:

1. Apply in 45 L of water per ha at a pressure of 310 kPa.
2. Direct spray pattern 45 degrees forward and adjust boom height to give uniform coverage.
3. Spray drift can be further reduced under windy conditions by using flood type nozzles at a nozzle spacing of 100 cm. Operate at 275 kPa and direct the spray pattern 45 degrees forward. Adjust boom height to obtain uniform coverage.
4. Use the higher rate when the wild oat density is 50 plants per square metre or more, or when wild oats are not actively growing, i.e., under dry cool conditions or when wild oats have been injured by frost or wind.

Timing:

1. Apply at the two-leaf stage of the wild oats, that is, from the first appearance of the second leaf until the first appearance of the third leaf.
2. Best results are obtained when the wild oats reach the two-leaf stage in less than 9 days after emergence. When growth is slow, spray before the 14th day after emergence.
3. DO NOT treat wheat, barley or lentils after they have reached the 4-leaf stage or 14 days after emergence.
4. DO NOT treat flax before the 2 (true) leaf stage or 14 days after emergence.
5. DO NOT apply to peas after the 5-leaf stage.
6. DO NOT apply to forage grasses and legumes after the 3-leaf stage.

Mode of Action:

Barban kills or stunts wild oats plants. The effect is gradual and may not be visible for 2-3 weeks after spraying. The degree of control is largely dependent upon the uniformity of emergence of the wild oats.

Precautions:

1. DO NOT apply when the crop is wet with dew or rain.
2. Crops may show somewhat less tolerance to Wypout 250 than to Wypout. DO NOT use Wypout 250 on Park wheat.
3. These herbicides may be stored at freezing temperatures, but must be returned to their original state by warming to room temperature (20-22°C) and agitating thoroughly on several successive days before use.
4. DO NOT graze or feed crop for 5 weeks after treatment.
5. Crop damage may occur if sprayed within 24 hours of frost.
6. Wild oat and crop growth will be retarded when cold, dry or low fertility conditions exist.

Mixing:

DO NOT mix WYPOUT or WYPOUT 250 with other pesticides, fertilizers or spray adjuvants.

*WARNING — "Safety data and registration of these products are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using".

2,4-D, MCPA

Formulation:	**g active ingredient/litre**
2,4-D, Low Volatile ester	600, 700, 512, 400
2,4-D, MCPA, amine, ester	500
MCPA sodium salt	300
MCPAK (potassium salt)	400

Registered Uses:

Crops

	Recommended Rates (product)
Wheat (spring, durum), barley, rye	2,4-D[1] up to 1.1 L/ha
	MCPA[1] up to 1.25 L/ha
Flax, oats	MCPA[1] up to 1.1 L/ha
Peas	MCPA amine up to 560 mL/ha
	MCPA sodium salt up to 700 mL/ha
Winter wheat	2,4-D[1] and MCPA[1] — up to 840 mL/ha
Seedling forage grasses	2,4-D amine and MCPA — up to 1.1 L/ha
Established forage grasses	2,4-D[1] and MCPA — up to 4.4 L/ha

Weeds controlled by 2,4-D[1]:

560-840 mL/ha

Lamb's-quarters, mustards (except dog and green tansy), ragweeds

.84-1.1 L/ha

burdock-seedlings
cocklebur
flixweed — fall rosettes
— spring seedlings
goat's-beard — seedlings
kochia — 2-4 leaf
narrow-leaved hawk's-beard
— fall rosette
— spring seedlings
plantain
prickly lettuce
Russian pigweed
shepherd's-purse
— fall rosettes
— spring rosettes
stinkweed — fall rosettes
— spring seedlings
annual sunflower
sweet clover
wild radish

1.25-1.7 L/ha

alfalfa
biennial wormwood**
bluebur
field peppergrass**
flixweed — spring rosettes
hairy galinsoga
oakleaf goosefoot
pineapple weed**
prostrate amaranth
purslane
redroot pigweed
Russian thistle
shepherd's-purse
— spring rosettes
stinkweed — spring rosette
tumble pigweed
annual sow-thistle
blue lettuce*
dandelion*
docks*
Canada thistle*
field bindweed*
hedge bindweed*
hoary cress*
perennial sow-thistle*
Russian knapweed*
leafy spurge*

Weeds controlled by MCPA[1]:

.7-1.1 L/ha

burdock
cocklebur
stinkweed
flixweed
kochia
lamb's-quarters
mustards (except dog and green tansy) prickly lettuce
Russian pigweed
shepherd's-purse
annual sunflower
wild radish
ragweeds
field horsetail*
hoary cress*
plantain

1.25-1.7 L/ha

biennial wormwood
bluebur
dog mustard
field peppergrass
hairy galinsoga
hemp-nettle***
goat's-beard
oakleaf goosefoot
redroot pigweed
annual sow-thistle
sweet clover
tumble pigweed
Canada thistle*
dandelion*
docks*
field bindweed*
perennial sow-thistle*

* Top growth control only

** Controlled by 1.7 L/ha rate only

*** Suppression only

[1]These rates are for the amine formulations of 2,4-D and MCPA (500 active ingredient/litre). For rates of other formulations of 2,4-D and MCPA see conversion factors on Page 47.

Application and Timing:

A. General

In cereals, apply in 90-100 L of water/ha.
In flax, use 100-165 L of water/ha

B. Wheat (spring, durum), barley, rye

1. These crops can be sprayed safely from the 4-leaf stage up to just before the flag-leaf stage with rates of 2,4-D[1] up to 1.1 L/ha and MCPA[1] at .84-1.25 L/ha. MCPA at rates of 700 mL/ha and below can be applied after the 2-leaf stage of the crop.
2. Treatment at the 4-leaf stage will usually combine best crop tolerance and maximum weed susceptibility.
3. Treatment with 2,4-D ester before or during the 3-leaf stage in wheat or barley will likely cause leaf, stem and head deformities and may reduce yield up to 10%. If these crops must be treated before the 4-leaf stage, use the amine formulation of 2,4-D or MCPA.
4. Rates higher than those given in (1) may be necessary when the crop is heavily infested with semi-tolerant weeds. These higher rates may cause some crop injury particularly if 2,4-D ester is used. However, the injury may be more than offset by increased yield due to reduced weed competition. Use of an amine rather than an ester will reduce the risk of crop injury.

C. Oats.

1. 2,4-D (especially the ester formulation) is not recommended on oats.
2. Oats can be treated safely with MCPA[1] at up to 1.1 L/ha from the 1-leaf stage up to just before the flag-leaf stage.
3. If 2,4-D must be used, apply the amine form at up to 980 mL/ha from the 1-leaf stage to the 3-leaf or from the 6-leaf stage to just before the flag-leaf stage.
4. If heavy infestations of weeds resistant to 2,4-D or MCPA amines are present, use herbicides or mixtures containing Banvel or Torch/Pardner (bromoxynil) rather than 2,4-D ester.

Precautions:

Both the ester and amine formulations will cause floret sterility and severe yield losses if applied during the flag-leaf to the fully headed stages of cereals.

D. Flax

1. 2,4-D is not recommended on flax. Use MCPA amine applied after the crop is 5 cm tall and before bud formation.
2. Rates of MCPA ester of 840 mL/ha or more, MCPA amine of 980 mL/ha or more or MCPA sodium salt of 1.9 L/ha or more will usually cause some delay in maturity. Any potential yield reductions should be offset by increased yields due to better weed control.

E. Peas

1. 2,4-D is NOT recommended on peas.
2. Treat when vine length is less than 15 cm and peas are in the 2-6 leaf stage.
3. Use MCPA amine or sodium salt in 165-220 L water/ha.
4. Phenoxy herbicides may cause maturity delays in peas.

F. Winter Wheat

Apply in spring from the time the crop commences growth until the flag-leaf stage.

G. Forage grasses

1. Seedling grasses may be sprayed from the 3-leaf stage to just before the shot-blade stage. Apply in 100-165 L of water/ha in bromegrass, creeping red fescue, crested wheatgrass, intermediate wheatgrass and Russian wild ryegrass. Do not use 2,4-D ester.
2. Established grasses may be sprayed in the spring up to the shot-blade stage or in the fall after harvest. Apply in 100-165 L of water/ha.

Mode of Action:

2,4-D and MCPA are translocated and cause rapid undifferentiated growth which usually results in death of susceptible plants.

Formulations	Risk of Vapor Drift	Activity on Weeds	Risk of Crop Injury	Risk of Rain Losses	Storage Requirements
Low Volatile Ester	Medium	Fast	Medium	Low	Can be frozen — warm and agitate
Amine	Very Low	Medium	Low	Medium	Do not freeze
Salts	Very Low	Slow	Very Low	High	Do not freeze

To convert from 500 g active ingredient/litre to other activities multiply by the following:

300 g active ingredient/litre — 1.67
400 g active ingredient/litre — 1.25
512 g active ingredient/litre — .98
600 g active ingredient/litre — .83
700 g active ingredient/litre — .71
800 g active ingredient/litre — .63

Herbicide Tank-Mixes

	Banvel LH	Brominal M	Buctril M	Bromox 450 M	Embutox E	Hoe-Grass	MCPA amine	MCPA ester	MCPA K or Na +	Pardner/Torch/TorchDS	Premerge 360	Sabre	Sencor 500	Target	Treflan	Tropotox	2,4-D amine	2,4-D ester
Afolan, Lorox							•							•				
Amiben															•			
Asulox F			•		•													
Avadex BW*															•			
Avenge 200-C		•	•	•				•		•		•						•
Banvel LH							•		•				•				•	
Basfapon, Dowpon							•		•		•					•		
Lexone	•						•								•			
TCA			•				•		•							•	•	
Pardner						•	•	•	•								•	•
Poast		•	•	•			•	•										
Sencor 500	•						•							•	•		•	
Sencor 75 DF															•			
Stampede 360								•									•	•
Torch/Torch DS						•	•	•	•								•	•

- Tank mixes registered and recommended for use.

Herbicide mixtures can be used to advantage where weed infestations are composed of a mixture of weeds with varying susceptibilities to any one herbicide or where grassy and broadleaf weeds are present. **Use mixtures only when they are registered and recommended for use.** Other mixtures may not be effective, may injure the crop or may leave a harmful residue in the treated crop. In many cases an interval of a specified time must occur between the application of two different products either to avoid the risk of reduced weed control or increased crop injury.

The above chart summarizes the situation with respect to tank-mixing of herbicides for use in field crops. **Consult specific product sections or product labels for details on crops or crop varieties that these mixes may be applied on.**

***Warning** — "Safety data and registration of these products are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using."

HERBICIDES FOR USE IN FORAGE CROPS

Herbicide	Seedling Grass											Seedling Legume					Est. Grass			Established Legume					Cover Crop			
Consult the label for final detailed instructions	Bromegrass	Creeping Red Fescue	Crested Wheatgrass	Inter. Wheatgrass	Kentucky Bluegrass	Meadow Fescue	Orchardgrass	Reed Canarygrass	Russian Wild Ryegrass	Slender Wheatgrass	Timothy	Alfalfa	Alsike Clover	Red Clover	Sweetclover	White Clover	Grasses	Bromegrass	Russian Wild Ryegrass	Alfalfa	Alsike Clover	Birdsfoot Trefoil	Red Clover	Sweetclover	Barley	Flax	Oats	Wheat
Asulox F												X[1]								X[1]						X		
Avenge DW												X[2]	X[2]	X[2]	X[2]	X[2]									X	X		X
Avenge 200-C	X[2]	X[2]	X[2]		X[2]	X[2]	X[2]	X[2]	X[2]		X[2]	X[2]		X[2]	X[2]										X			X[3]
Banvel																	X	X	X									
Basfapon/Dowpon												X			X											X		
Bucril-M	X[4]	X[4]	X[4]	X[4]		X[4]	X[4]	X[4]	X[4]	X[4]	X[4]														X	X	X	X
Carbyne/Wypout	X	X[4]	X[4]						X		X[4]	X	X	X	X			X	X	X	X		X	X	X	X		X
Embutox 5/Butyric 400												X	X	X		X				X					X		X	X
Eptam 8E												X																
Hoe-Grass	X[5]	X[5]	X[5]	X[5]					X[5]			X[5]		X[5]	X[5]										X	X		X
Kerb 50W																	X[6]	X[6]	X[6]	X[6]		X[6]						
Matrven	X[4]	X[4]	X[4]	X[4]		X[4]			X[4]			X[4]																	X
MCPA	X	X	X	X					X								X	X	X						X	X	X	X
Pardner	X[4]	X[4]	X[4]	X[4]		X[4]	X[4]	X[4]	X[4]	X[4]	X[4]														X	X	X	X
Princep																				X[6]								
Sinbar																				X[6]		X[6]						
Torch/Torch DS	X[4]	X[4]	X[4]	X[4]		X[4]	X[4]	X[4]	X[4]	X[4]	X[4]																	
Tropotox Plus												X	X	X		X									X		X	X
2,4-D	X[7]	X[7]	X[7]	X[7]					X[7]								X[7]	X[7]	X[7]						X			X

X — Product is recommended for the crop.

1. For seed production only.
2. Do not graze or feed during the year of establishment. Use only when forage seedlings are underseeded in crops for which herbicide is registered.
3. Neepawa, Glenlea, Chester, Selkirk, Macoun, Canuck, Benito. Columbus, Leader.
4. For seed production only, only in year of establishment.
5. Use in year of establishment only. Do not use Forage For Feed.
6. Pure stand only. Low rates of Kerb 50W may be used on mixed stands.
7. Use 2,4-D amine only.
8. For Forage use only.

Fall Weed Control

A. Post-emergence Herbicides

Fall weed control is an extremely important part of any tillage system. If winter annuals are not controlled in the fall or early spring, they mature beyond the susceptible period and cause substantial moisture and nutrient loss. Perennial weed control should be done in the fall to minimize crop competition losses in the spring, provided the following conditions are met: There is adequate moisture to promote new active growth of the weeds and killing frost is not likely to occur within two weeks of application. Good growing conditions for at least two weeks following treatment are required for best results.

1. **Winter Annuals**
   Stinkweed, flixweed, shepherd's-purse — Apply 2,4-D[1] or MCPA[1] at .84-1.1 L product/ha. This treatment should be applied in 100 L of water/ha to emerged weeds prior to freeze-up.

   Narrow-leaved hawk's-beard, stinkweed, flixweed — Apply Embutox E or 2,4D Butyric 400 to alfalfa when weeds are in the seedling rosette stage. Apply in 220 L of water/ha after the alfalfa has stopped growth but before freeze-up.

2. **Canada Thistle — Perennial Sow-Thistle**
   Apply 2,4-D[1] or MCPA[1] at 2.2 L product/ha OR Estaprop at 1.9 L product/ha, OR Kilmor at 1.7 L product/ha, OR Target at 2.0 L product/ha, after harvest in 100 L water/ha. Allow two or three weeks after treatment before working the soil.

   OR

   Apply Amitrol-T at 22-25 L product/ha in at least 200 L water/ha (spot treatment) to actively growing plants that are 15-20 cm tall. Follow with tillage in 2-3 weeks. Do not apply after October 1.

   OR

   Apply Banvel at 1.5-2.8 L product/ha tank-mixed with 2,4-D[1] amine at 1.1-2.2 L product/ha in 100 L of water/ha. OR Banvel alone at 3.0 L product/ha in at least 100 L water/ha. Apply Banvel treatments when plants are actively growing and follow with tillage in 2-3 weeks. The use of Banvel at these rates after Sept. 1 may result in residue carry-over that will damage the following crop. Plant only cereal crops the year after treatment.

   OR

   Apply Roundup at 4.7-7.0 L product/ha in at least 100 L of water/ha (spot treatment) to actively growing plants that are 20-25 cm tall. Hard frost shortly before or after application will greatly reduce the effectiveness of this treatment.

   Note: None of the above listed treatments used alone will give complete control of Canada Thistle and Perennial Sow-Thistle. Control of these perennial weeds requires combined program of treatment in the crop and in the stubble after harvest or on summerfallow.

3. **Quackgrass**
   One Season Control: Apply Roundup at 2.5 L product/ha after harvest in the fall in annual cropping systems. Apply in 50-100 litres of clean water per hectare using flat fan nozzles. Spray when most quackgrass is at least 20 cm in height (3 to 4 leaf stage of growth), and actively growing. If quackgrass is sodbound, reduced control will result. If a frost has occurred, wait several days to determine if the quackgrass has recovered. Quackgrass can be treated after a mild frost provided there are 3 to 4 green leaves actively growing at the time of application. Do not apply after the first damaging frost in the fall. Do not till between harvest and fall application. Allow 5 or more days after application before tillage.

   Long Term Control: Apply Roundup at 4.7-7.0 L product/ha in at least 100 L of water/ha to actively growing plants that are 20-25 cm tall. Hard frost shortly before or after application will greatly reduce the effectiveness of this treatment.

[1]The rates given are for the amine formulations of 2,4-D or MCPA (500 g active ingredient/litre). For rates of other formulations of 2,4-D MCPA. See conversion table page 47.

B. Soil Incorporated Herbicides
Fall application of incorporated herbicides can result in less drying of the seedbed than spring applications. However, product selection and use should be determined on the basis of local soil and weather conditions. To reduce the risk of soil erosion use the minimum amount of tillage required for satisfactory incorporation of fall applied products. Where possible complete the incorporation procedures in the spring. Conserve trash cover on summerfallow. Granular formulations can be used under trashy conditions. Where the required incorporation will result in excessive trash destruction or soil pulverizaton do not use the product in the fall.

Avadex BW (liquid or granular): For use in wheat, barley, flax, canola, flax and mustard. See Page 8.

Treflan EC (liquid) or Treflan QR5 (granular): For use in canola, sunflowers, peas, mustard, fababeans, flax and lentils. See Page 42.

Zero-Tillage Spring Treatment

Weed control before crop emergence is essential to successful crop production in a zero-tillage program. All existing weed and volunteer crop growth should be destroyed shortly before crop emergence.

Wheat, Barley, Oats: Apply Roundup at 1.2 L product/ha tank-mixed with 350 mL/ha of a non-ionic surfactant (e.g. Agral 90, Ag Surf, Triton XR) in 100 L water/ha to control wild oats, green foxtail, volunteer cereals and wild mustard. If wild buckwheat, lady's-thumb or lamb's-quarters are present add Torch or Pardner (225) at 1.25 L product/ha or Torch DS at 625 mL product/ha or Pardner (281) at 1.0 L product/ha to the tank-mix. **Note:** Do not apply Roundup after crop emergence.

Forage Legumes and Grasses: Apply Roundup in 100 to 300 litres of clean water/ha to control emerged vegetation **prior** to emergence of forage legume and grass seedlings. If legumes and grasses are to be underseeded with a cover crop, Roundup must be applied prior to planting a labelled cover crop. Apply at the recommended label rates and stage of weed growth. Tillage such as fall plowing, spring plowing, discing or mowing prior to application will reduce effectiveness on perennial weeds.

Chemical Fallow or Minimum tillage Fallow Treatments

Apply Roundup at 1.2 L product/ha tank mixed with 350 mL of a non-ionic surfactant (e.g. Agral 90, AgSurf, Triton XR) in a minimum of 100 L clean water/ha to control wild oats, green foxtail, volunteer cereals and wild mustard. If wild buckwheat, lady's-thumb or lamb's-quarters are present add Torch or Pardner (225) at 1.25 L product/ha or Torch DS at 625 mL product/ha or Pardner (281) at 1.0 L product/ha to the tank-mix. Apply to actively growing annual grasses and broadleaf weeds less than 15 cm tall. Allow at least 3 days after treatment before tillage.

Roundup does not provide residual weed control. Repeat treatments may be necessary. Apply Roundup with ground equipment only, avoid drift to prevent injuring valuable vegetation. Thoroughly wash equipment after spraying, do not contaminate water sources by disposal of wastes or cleaning of equipment. Do not use Roundup in galvanized spray equipment.

OR

Apply Sweep* at 2.25 L/ha in 100 L of water/ha when annual grasses are in the 2-4 leaf stage. In most seasons, 2 applications will be required for annual grass control, one in late May or early June and another in late July or early August. In some seasons, 3 applications may be required for season long control. If broadleaf weeds such as wild buckwheat or other hard to kill broadleaf weeds are present at the time of application or between applications of Sweep, apply a recommended broadleaf weed killer such as 2,4-D, MCPA, Torch, Torch DS, Pardner, Banvel or Afolan F or Lorox L plus MCPA either as a tank-mix with Sweep or as a separate application at the recommended rate for each specific product. Afolan or Lorox should only be applied once per season and only in the spring.

Use clear water for applying Sweep and apply with ground equipment only. Applications on cloudy days or just before darkness will generally increase the effectiveness of the treatment. Avoid drift onto nearby valuable vegetation. Thoroughly wash equipment after spraying. Use a detergent at 30 mL/60 L of water, circulate and spray out, then rinse with clean water. When possible, fill sprayer with clean water and let stand overnight before draining.

***WARNING** — "Safety data and registration of these products are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using".

Perennial Weed Control

1. Spot Treatment in Summerfallow

Canada Thistle — Perennial Sow-Thistle

Cultivate in spring and allow thistles to grow to the early bud stage and then apply Banvel at 3.0 L product/ha alone or at 1.5-2.8 L product/ha in combination with 2,4-D amine at 2.2 L product/ha in 100 L of water/ha. Cultivate 3 weeks after treatment. If application is made after September 1 or if soil moisture levels are extremely low subsequent to application crop injury may occur.

OR

Apply Amitrol-T at 22.0-35.0 L product/ha or Cytrol at 18.75-27.9 L product/ha when the thistles are in the bud-bloom stage. Resume cultivation three weeks after treatment or follow-up with other chemical treatments as required.

OR

Work summerfallow or apply chemical fallow treatment as usual in the spring to control early germinating weeds and volunteer grain. Allow thistles to grow to the bud stage. Apply Roundup at 4.7-7.0 L product/ha in at least 100 L of water/ha. For Canada thistle allow at least 10 days before resuming cultivation. Do not use Roundup in galvanized spray equipment.

Quackgrass

Apply Amitrol-T at 22.0-35.0 L product/ha or Cytrol at 18.75-27.9 L product/ha when quackgrass is growing rapidly and growth is 15 to 20 cm in height. Use at least 280 L of water/ha. Plow or disc the treated area about 3 weeks after treatment when the quackgrass has turned white or purple. Spot treat any green re-growth. Repeat applications will be necessary where plowing or cultivation is not practised.

OR

Work summerfallow or apply chemical fallow treatment as usual in the spring. Allow quackgrass to grow until just prior to heading. Apply Roundup at 4.7-7.0 L product/ha in at least 100 L of water/ha. For quackgrass allow at least 5 days after treatment before resuming cultivation. Do not use Roundup in galvanized spray equipment.

Field Bindweed

Allow bindweed to grow to the flowering stage and then apply either one of the following treatments:

Apply Banvel alone at 3.0 L product/ha or at 2.8 L product/ha mixed with 2,4-D amine at 2.2 L product/ha in 100 L of water/ha. Resume cultivation as required if re-growth occurs. Plant only cereal crops the following year and treat with 2,4-D or Banvel and 2,4-D mixtures as recommended for cereal crops.

OR

Apply Roundup at 7.0-12.0 L product/ha in 100 L of water/ha. Plant to cereal crops the following year and treat with 2,4-D or Banvel and 2,4-D mixtures as recommended for cereal crops. Do not use Roundup in galvanized spray equipment.

2. Spot Treatment in Wheat, Oats, Barley, Seed Forages

Roundup may be used for spot treatment of quackgrass, Canada thistle, and other perennial weeds in wheat, oats, barley and seed forages. Treatment may be made up to heading of small grains and seed forages. Apply at recommended label rates and stage of weed growth. Applications can be made with a boom sprayer, hose and handgun or hand sprayer. **The Crop in the Treated Area Will Be Killed.** Take care to avoid drift outside the target area.

Volunteer Crop Control

Volunteer crops can be serious weed problems in seed fields and in continuous cropping programs. Since there are very few herbicides registered for controling volunteer crops, control by herbicides alone is often inadequate. Therefore, control should be based on timely tillage supplemented, where possible, by herbicides. Choice of herbicides is limited and thus consideration must be given to choosing crop rotations which allow for use of an appropriate herbicide. At no time should a herbicide be used for volunteer crop control unless it is registered for use in the crop being grown.

The suggestions for volunteer crop control found in the chart at the centre of this booklet are based largely on field observations. In most cases the herbicides are not registered for this purpose and so any such use is entirely at the risk of the user. Follow label recommendations regarding rates, stage of application, water volumes etc. that apply to the crop being produced. Most of these treatments will result in suppression rather than complete kill and satisfactory control will depend on competition from a vigorous crop. Use the highest rate that is safe for use in the crop being produced.

Herbicide and Liquid Fertilizer Mixes

Some herbicides can be mixed with liquid fertilizers for once over application of both

products. This practice should be used only for products which have been registered for this use. Thorough mixing and even application are required. Accurate calibration of application equipment is essential to ensure that the correct rate of herbicide is applied. Test the compatibility of the herbicide in the liquid fertilizer before adding the herbicide to the tank. Ensure that there is sufficient agitation to maintain uniform mixture in the tank at all times. There are compatibility agents available which produce a more uniform mixture. Check the herbicide label for specific names of agents and directions.

The following products can be applied with liquid fertilizer:

AATREX (Atrazine)
AVADEX BW (triallate)
EPTAM (EPTC)
ERADICANE (EPTC + R25788)
SUTAN (alone or with AATREX)
TREFLAN (trifluralin)
TREFLAN + AVADEX BW

NOTE: For specific directions regarding a herbicide and liquid fertilizer mix, refer to the product label.

Soil Residual Herbicides

When applied at recommended rates in a crop, most herbicides disappear within a few weeks after application and impose no restriction on cropping options the next year. However, some herbicides do not disappear quickly and can persist in the soil for many months, or years following application, thereby restricting the crops that can be grown in rotation. Herbicides disappear from soils by various means. However, as a rule disappearance processes are favoured by mild and moist conditions. During winter when the ground is frozen, and the summer when the soil is dry, herbicide losses are minimal.

Growers should be aware of the residual properties before applying any herbicide if they are to avoid cropping restrictions in following years. A knowledge of the limitations associated with herbicides which leave a soil residue, along with an accurate record of application (i.e. rates, locations) will serve to minimize rotational problems.

Herbicides that leave a soil residue and are of particular concern in Saskatchewan are as follows;

AVADEX BW (liquid and granular) — The major mode of disappearance of Avadex BW from the soil is through volatilization. Under normal conditions, Avadex BW will not leave a harmful residue in the soil to affect following crops. Under dry conditions, however, some Avadex BW may carryover. Therefore, oats should not be sown the year following application.

BANVEL LH — At recommended rates of application for use in cereal crops Banvel will not leave a harmful residue in the soil. However, high rates of application recommended for perennial weed control in summerfallow and in stubble after harvest may result in residue carryover that will damage the following crop. This is particularly true if application is made after September 1 or if soil moisture levels are extremely low following application. Plant only cereal crops the year after treatment.

GLEAN — Soil moisture is important for the disappearance of Glean from treated soils, the greater the soil moisture the faster the disappearance. Soil pH also determines the rate of Glean disappearance from the soil. Several crops including canola, mustard, field peas, flax and lentils are extremely sensitive to Glean residues in the soil. As a result, the use of Glean is limited to continuous wheat or barley production, and to soils having a pH of less than 7.5. Residual effects may last 3 to 5 years depending upon rate applied and weather conditions. A field bioassay* is required prior to planting crops other than wheat or barley.

TORDON 202-C — The disappearance of Tordon 202-C from soils occurs slowly and varies according to location, climatic conditions and rate of application. Adequate moisture, warm temperatures and high organic matter content favour the degradation of Tordon 202-C, in addition, leaching also plays a role in the disappearnace of Tordon 202-C residues.

Several broadleaf crops, including forage legumes, sunflowers, lentils, fababeans, beans, peas and potatoes, are very sensitive to Tordon 202-C residues in the soil. It is recommended that susceptible crops not be seeded in a treated field for a minimum of 3 years after a Tordon 202-C application and that a field bioassay be conducted the year prior to seeding a crop other than wheat, barley, oats, flax, canola, mustard, rye, triticale, corn or canary seed.

TREFLAN (liquid and granular) — The major mode of disappearance of Treflan products from treated soils is by volatilization. This process is favoured by moist soil conditions. Dry conditions in the year during which a Treflan treated crop is grown may result in residue levels that will carry-over into the next season and injure wheat crops. To reduce the risk of wheat injury avoid deep seeding into cold ground. Barley is more tolerant to Treflan residues than wheat. Do not plant oats, fall rye, canaryseed or small seeded grasses for 18 months after a spring application or 22 months after a fall application of Treflan.

***Note:** A field bioassay means growing to maturity a test strip of the crop(s) intended for production the following year.

Aircraft Application

Aircraft applicators must exercise great care when applying herbicides if they wish (i) to get even distribution of the material, (ii) to avoid damage to nearby crops, and (iii) to avoid injury to the crop being treated. The following suggestions are offered to help minimize these hazards.

I. In order to get best coverage of plants in the treated swath and to minimize the loss of spray material to the atmosphere.
   (1) Do not spray in winds over 15 km/h.
   (2) Operate sprayer at 200 kPa except as specified for products such as barban (the higher the pressure the smaller the droplets).
   (3) For best results apply herbicides in volumes not less than 35 L/ha.
   (4) Fly as low as is feasible and safe.
   (5) Width of swath should not be more than 1.25 of wingspan (i.e. in most cases not more than 13.1 m).
   (6) Space the nozzles on the boom to give uniform distribution in the swath in spite of swirl from propeller and vortexes at the wingtips.

II. To Avoid Drift Damage from Aircraft application.
   (1) Do not spray when wind is blowing toward a sensitive crop, shelterbelt or garden. Safe distances cannot be given.
   (2) Do not spray in dead calm near sensitive plants. The "cloud" of suspended droplets may drift onto sensitive plants when the wind comes up.
   (3) Amines are less volatile than "low volatile" esters and should be used in preference to the low volatile esters.

III. To Avoid Injury to Crops.
   (1) Use water as a carrier in preference to oil. Injury is more likely to occur with oil than with water.
   (2) In order to minimize delay in maturity of flax, volumes of 55 L or more/ha should be used.
   (3) Apply at "safe" stage of growth of the crop.
   (4) Select the best chemical for the crop and weeds that are present and use only enough material for the degree of control desired.

Aircraft Application Chart

The following products are registered to be applied by aircraft to the crops indicated. Refer to the section on each product for rates of safe application.

	Barley	Oats	Rye	Wheat	Flax	Canola	Must.	Sflrs.	Peas
2,4-D amine	X		X	X					
MCPA amine	X	X	X	X	X				
Carbyne/Wypout	X			X	X	X	X	X	X
Avadex BW Granular	X			X	X	X	X		
Avenge 200-C	X			X[1]					
Reglone (Crop Desiccation)					X	X	X	X	X
Brominal M/Bromox 450 M	X	X		X					
Hoe-Grass	X[3]		X	X	X	X	X		
Mataven				X[2]				X	
Poast					X	X			
Sabre	X	X		X					

1. Glenlea, Neepawa, Chester, Macoun, Selkirk, Canuck, Benito, Columbus, Leader.
2. Do not use on Selkirk wheat.
3. Do not use on Betzes, Klages or Norbert.

Crop Desiccation

The use of chemicals to desiccate crop foilage and weed growth can reduce the time from maturity to harvest and reduce harvesting difficulties in many crops. Desiccation does not, however, speed up the maturity of a crop. Treatments should not be applied until the crops have reached maturity.

Flax — Mustard — Canola

In light stands or fields free from weeds, apply Reglone (diquat) at 2.25 L product/ha. In heavy stands or fields which contain weeds, use 2.8 L product/ha. Use at least 45 L of water/ha. Add Agral 90 at a rate of 0.1% of the total spray mixture.

Apply by means of a fixed wing aircraft fitted to apply uniform spray coverage.

Flax

Spray when the crop is at the 75% ball turn stage (normal swathing time). Do not apply when the crop is immature. Combine when the flax seed tests dry. Germination of seed is not affected by this treatment.

Mustard

Spray when the crop is at the 55-75% seed turn (green to brown) stage. Do not apply when the crop is immature or past the recommended stage of maturity. Pod and stem kill takes place in 7-10 days after application and eliminates the need to swath. Desiccation also allows the delaying of swathing until just before combining, thus reducing the risk of losses due to blowing swaths. Commence combining no later than 14 days after treatment. Germination of seed is not affected by this treatment.

Canola (Polish type only)

Spray when the crop is at the 60-75% seed turn (green to brown) stage. Do not treat when the crop is immature or past the recommended stage of maturity. Commence combining no later than 14 days after treatment. Germination of seed is not affected by this treatment.

Sunflowers (Oil and Confectionery)

Apply Reglone at 1.4 L product/ha in 45 L of water/ha by means of a fixed wing aircraft fitted to apply uniform spray coverage. Spray when the seeds reach maturity (20-50% moisture in the seed and hull). Add Agral 90 at a rate of 0.1% of the total spray mixture. Germination of the seed is not affected by this treatment. Do not apply when the crop is immature or past the recommended stage of maturity. Commence combining 15-20 days after spraying.

Peas

Apply Reglone at 2.25 L product/ha in at least 20 L of water/ha. In heavy stands or fields which contain weeds apply Reglone at 2.8 L product/ha in at least 45 L of water/ha. Apply by means of a fixed wing aircraft fitted to apply uniform spray coverage. Spray when the crop has reached maturity. This treatment does not mature peas. Add AGRAL 90 at a rate of 0.1% of the total spray volume. Germination of seed is not affected by this treatment. Commence combining when the peas test dry.

Cleaning the Sprayer

To remove esters of 2,4-D and MCPA the following cleaning procedure should be followed:

a. Run clean water through the pump, tank, etc.
b. Remove and clean nozzles and screens in kerosene or diesel fuel.
c. With boom shut off, run 55-100 L of diesel fuel through the pump, lines, and tank for 10 to 15 minutes.
d. Wash down the inside of the tank with a mop or scrub brush.
e. Spray out through pump lines and drain thoroughly.
f. Half fill the spray tank with water.
g. Add household detergent (1 kg/250 L of water) and circulate for 5 to 10 minutes.
h. Wash down the inside of the tank with a mop or scrub brush.
i. Spray out through pump lines and drain thoroughly.
j. Since step. g. removes grease, it is advisable to re-grease the sprayer pump before using again.
k. Proceed to step d. below.

To remove amine or salt formulations proceed as follows:

a. After draining sprayer thoroughly, fill with clean water and circulate through pump, lines, etc.
b. Drain the sprayer.
c. Remove nozzles and screens and wash separately.
d. Fill with clean water containing 1 L of household ammonia per 100 L of water.
e. Circulate this solution through entire sprayer system.
f. Wash down the inside of the tank with a mop or scrub brush.
g. Allow to stand overnight.
h. Re-circulate cleaning solution for 5 to 10 minutes.
i. Drain entire sprayer system.
j. Rinse with clean water.

Chemical Products and Availability

Product	Common Name	Activity	Manufacturer	Container size	Available From (See List)
AAtrex	atrazine	500 g/L 90% WP	Ciba-Geigy	2x10 L, 2 kg	4, 12, 14
AAtrex Nine-O	atrazine	90% WDG	Ciba-Geigy	4.5 kg	4, 12
AAtrex Plus	atrazine + oil	400 g/L + oil	Ciba-Geigy	20 L	4, 12
Afolan F	linuron	450 g/L	Hoechst	10 L	7, 9, 10, 12
Amiben	chloramben	240 g/L	Union Carbide	20 L	9
Amitrol-T	amitrole	200 g/L	Allied	1, 10 L	1, 3, 7, 8, 10, 13
Asulox F	asulam	400 g/L	May & Baker	20 L	1, 3, 5, 8, 9, 10, 12
Atrazine 500	atrazine	500 g/L	Pfizer	10 L	9,14
Atrazine 5L	atrazine	500 g/L	IPCO	9 L	3, 9
Attra Mix	atrazine + oil	400 g/L + oil	Chipman	20 L	1, 8, 10, 12, 13
*Avadex BW	triallate	400 g/L, 10% G	Monsanto	22.7 L, 22.7 kg	1, 3, 7, 9, 10, 12, 13
Avenge 200-C	difenzoquat	200 g/L	Cyanamid	20 L	1, 3, 8, 9, 10, 12, 13
Banvel LH	dicamba	400 g/L	Velsicol	10 L	1, 3, 4, 8, 9, 10, 12, 13
Banvel 5G	dicamba	5% G	Velsicol	25 lb	1, 3, 4, 8, 9, 10, 12, 13
Basagran	bentazon	480 g/L	BASF	4, 10 L	8, 12, 14
Basfapon	dalapon	74% WSP	BASF	2.25kg	4, 7
Benazolin	benazolin	350 g/L	Boots-Hercules distributed by Green Cross	4 L	1, 4, 10, 14
Blagal	cyanazine + MCPA(1:2)	375 g/L	Ciba-Geigy	10 L	3, 4, 9, 10, 12, 13, 14
Brominal M	bromoxynil + MCPA	400 g/L, 450 g/L	Allied	20 L	3, 7, 8, 13, 14
Bromox 450 M	bromoxynil + MCPA	450 g/L	Allied	10 L	9, 14
Buctril M	bromoxynil + MCPA	450g/L	May & Baker	20 L	1, 3, 5, 8, 9, 10, 12
		562 g/L		16 L	
*Carbyne 2EC	barban	240 g/L	Velsicol	20 L	1, 3, 4, 7, 8, 10, 12, 13, 14
*Carbyne	barban	120 g/L	Velsicol	4 gal.	1, 3, 4, 7, 8, 10, 12, 13, 14
Compitox, Compitox + Cytrol	mecoprop	150 g/L	May & Baker	4,20 L	1, 5, 8, 9, 10, 12,
	amitrole	240 g/L	Cyanamid	20 L	2, 9
Dalapon	dalapon	74% WSP	IPCO	25 kg	3
Dowpon	dalapon	74% WSP	Dow Chemical	25 kg	3
Dynap	naptalam + dinoseb	3.6 lbs/gal	Uniroyal	1.5 gal	manufacturer, 7
Dyvel	dicamba + MCPAK	420 g/L	Velsicol	10 L	1, 3, 5, 7, 8, 10, 12, 13
Embutox E	2,4-DB	400 g/L	May & Baker	4,20 L	1, 3, 4, 5, 7, 8, 10, 12
Eptam-8E	EPTC	798 g/L	Chipman	20 L	1, 10, 12, 13, 14
		10% granular		20 kg	
Eradicane	EPTC + R25788	798 g/L	Chipman	20 L	1, 10, 12, 13, 14
Estaprop	Dichlorprop + 2,4-D	600 g/L	Niagara	20,200 L	7, 10
Glean	chlorsulfuron	75% DF	Dupont	500g	2, 3, 9, 12, 13
*Gramoxone	paraquat	200 g/L	Chipman	1.5 L	1, 10, 12, 13, 14
Hoe-Grass	diclofop methyl	190 g/L, 284 g/L	Hoechst	20 L	3, 10, 12, 13
Hoe-Grass II	diclofop methyl + bromoxynil	310 g/L	Hoechst	20 L	3, 10, 12, 13
Kerb 50W	propyzamide	50 WP	Rohm & Haas	2 kg	2, 3, 8, 12
Kilmor	dicamba + mecoprop + 2,4-D	500 g/L	Green Cross	2x10 L	1, 4, 5, 14
*Lasso	alachlor	480 g/L	Monsanto	20 L	9
		15% G		22.7 kg	
Lexone DF	metribuzin	75% DF	Dupont	2.5 kg	1, 2, 3, 7, 8
Lorox L	linuron	480 g/L	Dupont	10 L	1, 2, 4, 7, 8, 9, 10, 12, 13

***Warning** — "Safety data and registration of these products are under review. Directions for use and cautionary statements should be carefully followed. Read the label before using".

Chemical Products and Availability

Product	Common Name	Activity	Manufacturer	Container Size	Available From (See List)
Mataven	flamprop-methyl	84 g/L	Ciba-Geigy	20 L	3, 4, 9, 10, 12, 13, 14
MCPA	MCPA	300, 400, 500 g/L	various	various	various
Mecoturf	mecoprop	150 g/L	Niagara	20 L	7, 10
Monobor-chlorate	sodium metaborate tetrahydrate + sodium chlorate	97.8% G	Occidental Chemicals Co.	50 lb	5, 11
NaTA	TCA	85% WSP	Hoechst	25kg	3, 4, 7, 9, 10, 12, 13
Pardner	bromoxynil	225 g/L	May & Baker	20 L	1, 5, 8, 10, 12
		281 g/L		16 L	
Poast	sethoxydim	184 g/L	BASF	14 L	3, 12, 13, 14
Premerge 360	dinoseb	360 g/L	Vertac	110 L	3, 6
Princep Nine T	simazine	90% WDG	Ciba-Geigy	4.5 kg	4
*Randox	allidichlor	480 g/L, 20% G	Monsanto	18.9 L, 22.7 Kg	9
Reglone	diquat	200 g/L	Chipman	5,20 L	1, 10, 12, 13, 14
Roundup	glyphosate	356 g/L	Monsanto	1, 4, 10 L	1, 3, 4, 9, 10, 12, 13
Sabre	bromoxynil + MCPA	720 g/L	Allied	12.5 L	1, 3, 7, 8, 9, 10, 12, 13, 14
Sencor	metribuzin	75% DF	Chemagro	2 kg, 4 L	1, 4, 8, 9, 10, 12, 13
		500 g/L			
Sinbar	terbacil	80 WP	Dupont	2kg	1, 3, 4, 9, 10, 12, 13
Sinox PE	dinoseb	360 g/L	Niagara	20,100 L	7, 10
Stampede 360	propanil	360 g/L	Rohm & Haas	22.7 L	1, 3, 9, 10, 12, 13, 14
Stampede CM	propanil + MCPA (7:2)	460 g/L	Rohm & Haas	22.7 L	1, 3, 9, 10, 12, 13, 14
Sutan +	butylate	798 g/L	Chipman	20 L	1, 10, 12, 13, 14
*Sweep	paraquat	250 g/L	Chipman	2x10 L	1, 10, 12, 13, 14
Target	dicamba + mecoprop + MCPA	400 g/L	Green Cross	2x10 L	4, 5, 14
TCA	TCA	85% WSP	IPCO	25 kg	3
TCA Solution	TCA	41.5%	Pfizer	10 L	9, 14
Tenoran	chloroxuron	50% WP	Ciba-Geigy	2.7 kg	4
Torch	bromoxynil	227 g/L	Allied	20 L	1, 3, 7, 8, 9, 10, 12, 13, 14
Torch DS	bromoxynil	450 g/L	Allied	10 L	1, 3, 7, 8, 9, 10, 12, 13, 14
*Tordon 202C	picloram + 2,4-D	212 g/L	Dow	20 L	1, 3, 8, 9, 12, 13
Treflan	trifluralin	400 g/L	Elanco	25 gal/10 L	1, 3, 10, 12, 13, 14
		545 g/L		10 L	
		5% G		25 kg	
Tropotox	MCPB	400 g/L	May & Baker	4.20 L	1, 5, 7, 8, 9, 10, 12
Tropotox Plus	MCPB + MCPA	400 g/L	May & Baker	4.20 L	1, 5, 7, 8, 9, 10, 12
2,4-D	2,4-D	400, 500, 600 700 800 g/L	various	various	various
2,4-D Butyric 400	2,4-DB	400 g/L	Pfizer	10 L	9, 14
*Wypout	barban	120 g/L	Uniroyal	20 L	1, 7, 14
*Wypout 250	barban	240 g/L	Uniroyal	20 L	1, 7, 14

1. Cargill Grain
2. Chipman Chemicals
3. Federated Co-operatives
4. Green Cross
5. Mackenzie & Feimann
6. Neufeld Seeds, Saskatoon
7. Niagara
8. Oliver Chemicals
9. Pfizer
10. Pioneer Grain Co.
11. Saskatchewan Association of Rural Municipalities
12. Saskatchewan Wheat Pool
13. United Grain Growers
14. Independent Dealers

Abbreviations:
WP. wettable powder
WDG water dispersable granule
EC emulsifiable concentrate
G granular
WSP water soluble powder
DF dry flowable

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Additional Information

Publications

For more information on herbicides and weed control, consult the following publications available from your Agricultural Representative.

1. Guide to Field Sprayer Operation — —Saskatchewan Agriculture.
2. Weed Identification Series — Saskatchewan Agriculture.
3. Weed Control in Lawns — Saskatchewan Agriculture.
4. Shelterbelt Weed Control — PFRA.
5. Growth Habit and Control of Wild Oats — Agriculture Canada #1531. (Revised 1977.)
6. Winter Storage of Herbicides — Saskatchewan Agriculture.
7. Use of Soil Incorporated Herbicides in Saskatchewan — Saskatchewan Agriculture.
8. Weed Seedling Identification — Saskatchewan Agriculture.
9. Guide to Farm Practice in Saskatchewan.
10. Weed Control Notes on Buckwheat, Canaryseed, Corn and Field Beans — Saskatchewan Agriculture.
11. University of Saskatchewan Production Guides in Flax, Lentils, Field Peas, Fababeans.

Personnel

General Weed Control

Sask. Agriculture

Weed Control Specialist
Regina — 565-4673

Soils & Crops Specialists
Saskatoon — 664-5285
North Battleford — 445-6146
Swift Current — 773-2866
Tisdale — 873-2693
Weyburn — 842-4607
Yorkton — 783-9743

Agricultural Representatives

Agriculture Canada

Regina Research Station — 585-0255
Melfort Research Station — 752-2776
Scott Research Station — 247-2011
Swift Current Station — 773-4621

University of Saskatchewan — 343-2066

Chemical Company Technical Representatives

CACA Certified Dealers

Special Crops

Crop Development Centre (Saskatoon) — 343-4121, 343-3477
Indian Head Experimental Farm — 695-2274

Forage Crops

Melfort Research Station — 752-2776

Irrigation Crops

Sask. Agriculture — Outlook — 867-8683

Shelterbelts

PFRA Tree Nursery
Indian Head — 695-2284

Weed Control Equipment

University of Saskatchewan — 343-3191

Pesticide Safety

Sask. Agriculture — 565-4667

Metric Conversion Factors

Area

To convert hectares (ha) to acres — multiply hectares by 2.5
To convert acres to hectares (ha) — multiply by 0.4

Pressure

To convert kilopascals (kPa) to psi multiply kPa by 0.14

Weight

To convert lbs/ac to kilograms/hectares (kg/ha) multiply by 1.12
to convert kilograms/hectare (kg/ha) to lbs/ac multiply kg/ha by 0.89
To convert grams/hectare (g/ha) to ounces/ac multiply g/ha by 0.014

Volume

To convert litres/hectare (L/ha) to quarts/ac multiply L/ha by 0.35
To convert litres/hectare (L/ha) to pints/ac multiply L/ha by 0.71
To convert millilitres/hectare (mL/ha) to fl. oz./ac multiply mL/ha by 0.014
To convert gallons to litres (L) — multiply by 4.55
To convert gallons/acre to litres/hectare (L/ha) — multiply by 11.2

Length

1 mm	=	0.039 in.
1 cm	=	0.394 in.
1 dm	=	0.328 ft.
1 m	=	3.281 ft.
1 m	=	1.094 yd.
1 km	=	0.621 mi.

Area

1 cm^2	=	0.155 $in.^2$
1 dm^2	=	0.108 $ft.^2$
1 m^2	=	10.764 $ft.^2$
1 m^2	=	1.196 $yd.^2$
1 ha	=	2.471 acres
1 km^2	=	0.386 $mi.^2$

Volume

1 cm^3	=	0.061 $in.^3$
1 dm^3 (Or L)	=	0.035 $ft.^3$
1 m^3	=	35.315 $ft.^3$
1 m^3	=	1.308 $yd.^3$
1 L (litre)	=	0.880 qt.
1 L	=	0.220 gal.
100 L/ha	=	8.9 gal./acre

Mass

1 g	=	0.035 ounces (avdp)
1 kg	=	2.205 lb.
1000 kg	=	1.102 ton (short)
1 t	=	1.102 ton (short)

Speed

1 m/s	=	2.237 mph
1 km/h	=	0.621 mph

Pressure

1 N	=	0.225 lbs. force
1 kPa	=	0.145 psi
1 kPa	=	0.295 in. of mercury
1 Pa	=	0.0075 mm of mercury

All CACA Certified Dealers have successfully completed a Canadian Agricultural Chemical Association training program in the safe and proper use of agricultural pesticides. Look for this certificate when you purchase agricultural pesticides.

Major Poison Control Centres in Saskatchewan
Saskatoon — University Hospital — (306) 343-3323
Regina — Regina General Hospital — (306) 359-4545